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The Effects of Acceleration Rate on Vehicle Exhaust Emissions and Fuel Economy

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Technical Report

The Effects of Acceleration Rate on Vehicle Exhaust Emissions and Fuel Economy

by

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August, 1982

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16. ABSTRACT

This report summarizes a test program which was designed to explore the impact on exhaust emissions and fuel economy of coupling the dynamometer rollars (front and rear) and of using acceleration rates higher than those used on the Federal Test Procedure (FTP). A total of six vehicles were tested in this program. All five gasoline-fueled exhibited increases in hydrocarbons (HC) and carbon monoxide (CO) emissions on the Federal Test Procedure (FTP) driving cycle when the dynamomoeter rollars were coupled. The other results are strongly vehicle dependent.

17. KEY WORDS AND DOCUMENT ANALYSIS

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Introduction

This report summarizes a test program which was designed to explore the impact on exhaust emissions and fuel economy of:

1. Coupling the dynamometer rollers (front and rear) and
2. Higher rates of acceleration.

The testing was performed by the California Air Resources Board (CARB) for the U.S. Environmental Protection Agency (EPA) under contract number 68-03-2783, Task No. 4.

Control Technology Assessment and Characterization Branch (CTAB) has been interested in the general subject of "off-cycle" emissions for some time. "Off-cycle" operation is vehicular operation that exists on the road, which is not simulated at all or may not be simulated adequately by the Federal Test Procedure (FTP), and is important from the point of view of population exposure to the pollutants of interest that are emitted.

Of the infinite number of "off-cycle" conditions CTAB has currently identified, two appear to require further study. They are: 1) varying ambient temperature and 2) increased speed/load. The initial phase of the temperature work is done (see EPA/AA/CTAB/TA/81-7, "Carbon Monoxide and Non-FTP Ambient Temperature" February, 1981). The other area, speed/load, is generally considered to be conditions where the vehicle and/or engine speed and/or where the engine load are not simulated on our test cycles. Since vehicle accelerations are a type of maneuver which might involve speed/load "off-cycle" operation, several acceleration cycles were used as a surrogate for the more general speed/load case.

We previously identified vehicle acceleration rates greater than those of the FTP as being possible in actual vehicle operation via an analysis of existing data (Reference 19). We also calculated via hot, steady state, map and modal models that emissions might be sensitive to higher acceleration rates (Reference 23). This background work led us to suggest that this test program be considered as a candidate for a task order contract that the Test and Evaluation Branch had with the CARB.

The CARB work had essentially two parts. The first was an evaluation of the emissions and fuel economy on two cycles with and without a roll coupler. The two cycles were the clipped and unclipped LA-4 cycle. The original cycle's velocity versus time (v-t) plot was clipped of accelerations in excess of ± 3.3 mph/sec due to inadequacies of the belt-driven dynomometers in use at the time. Note that the uncoupled, clipped LA-4 is what we use now. A comparison of the clipped to the unclipped LA-4 test cycle is shown in Figure 1.

The second part of the program was to obtain emissions and fuel consumption data during several specified acceleration modes. The accelerations were specified as an initial and final speed to be accomplished in a given time such that the "accel rate" (actually the slope of the straight portion of the typical v-t graph) was a specified value. We planned to test below and above the + 3.3 mph/sec clip point for the LA-4, all the way to wide open throttle. In this way we hoped to identify parametrically the sensitivity of emissions and fuel consumption to accel rate for several vehicles.

The test data obtained from this program included gaseous exhaust emissions of hydrocarbons (HC), carbon monoxide (CO), carbon dioxide (CO_2), oxides of nitrogen (NOx), and sulfate emissions (SO_4). In addition, total particulate (TP) and opacity (smoke) were also measured for the Diesel vehicle. Fuel economy was calculated using carbon balance equations (40 CFR 600.113-78 (d) and (e)).

The test vehicles were a 1970 model year Impala, and 1980 model year, gasoline-fueled Pinto, Firebird, Saab 900 Turbo, and Volvo GL. Additionally there was a 1980 model year Rabbit Diesel. These cars are described in detail later in this report.

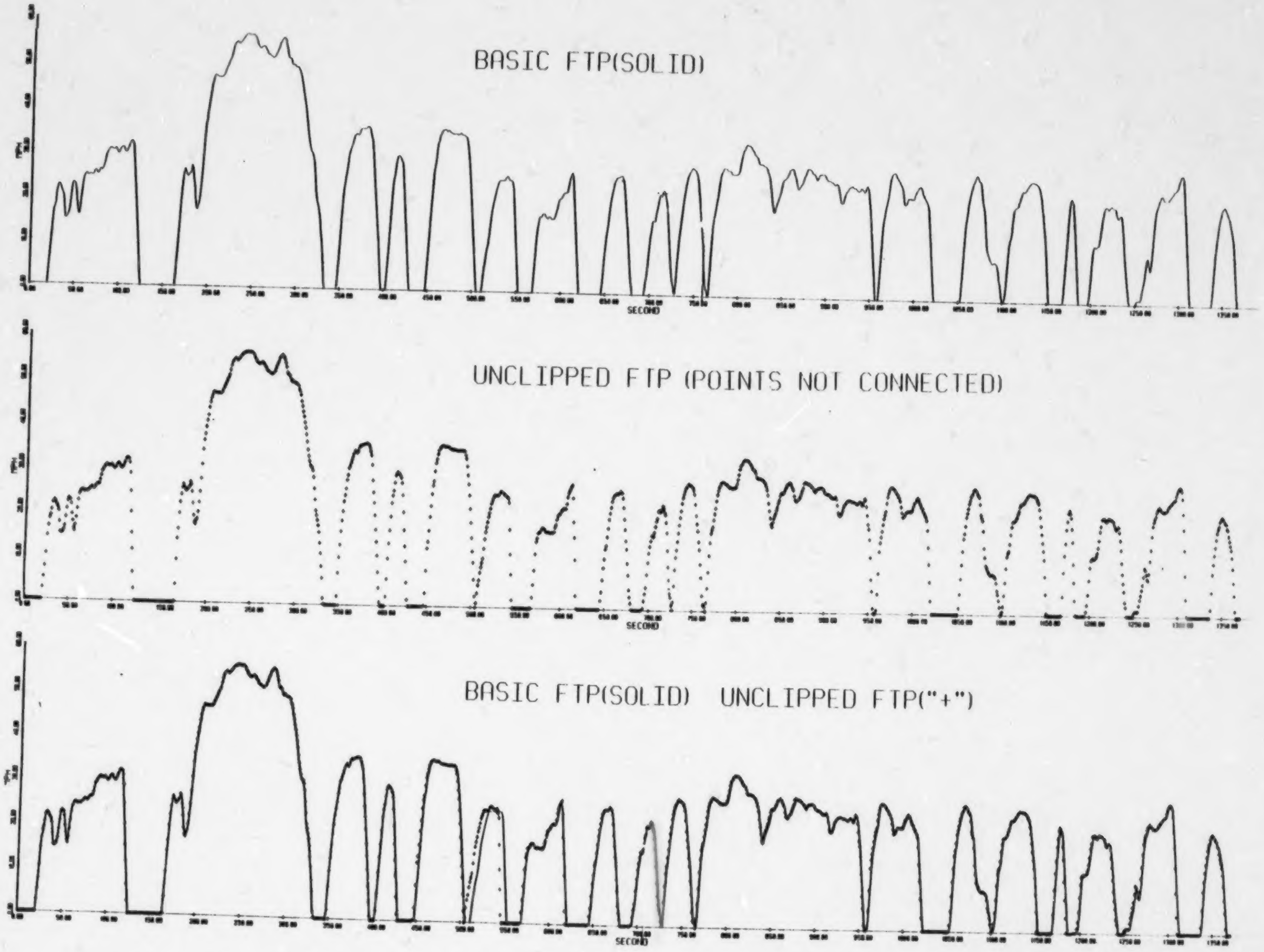

Figure 1

Test Cycles

Reproduced from best available copy.

Conclusions

1. Higher acceleration rates on the FTP while coupling the dynamometer rollers (i.e. unclipped, coupled versus standard FTP) resulted in increases in HC and CO emissions for the 1980 model year, gasoline-fueled vehicles. Both the Impala and the Pinto exhibited increases in fuel economy; the other four vehicles showed mixed results. The changes in NOx emissions were also mixed.

2. Coupling the dynamometer rollers resulted in statistically significant increases in both HC and CO emissions on both the clipped and the unclipped FTP test cycles as well as a slight decrease in the opacity of Diesel exhaust during acceleration cycles. The effects of coupling the rollers on NOx emissions and fuel economy on the FTP were mixed and strongly vehicle dependent.

3. The effects on emissions and fuel economy of employing higher acceleration rates on the FTP (i.e. clipped versus unclipped FTP test cycles) with either the dynamometer rollers uncoupled or coupled were mixed and not statistically significant.

4. Data from the acceleration test cycles were highly variable and are possibly unreliable. The data indicate that the effects of increasing acceleration rates or of coupling the dynamometer rollers (during those acceleration cycles) were not consistent and were strongly vehicle dependent.

5. In comparing the mean emissions of the 1970 model year Impala with those of the 1980 model year, gasoline-fueled cars (Pinto, Firebird, Saab 900 Turbo, and Volvo), we found:

    a) On the urban cycles (both the "clipped" and "unclipped" FTP performed both with and without the dynamometer rollers coupled), the four 1980 model year cars exhibited (relative to the 1970 car):

i) HC reductions of at least 83%,

ii) CO reductions of at least 82%,

iii) NOx reductions of at least 76%.

b) The data generated during the acceleration tests are mixed, and the comparisons were less clear-cut:

   i) The HC and CO emissions of the 1970 Impala exceeded those of the 1980 gasoline-fueled cars with the exception of the Firebird. There was no consistent relationship between the Impala and the Firebird with respect to HC or CO emissions.

   ii) The NOx emissions of the 1970 Impala during WOT accelerations were greater than those of the Pinto, Saab, or Volvo, all of which were greater than those of the Firebird. During the non-WOT acceleration tests, the 1970 vehicle emitted two to three times the amount of NOx as did the four 1980 gasoline-fueled cars.

Vehicles in the Test Program

Six passenger cars were tested by CARB in this program. Descriptions of those vehicles are presented in Table 1. A seventh car (vehicle number 5) was also scheduled to be tested; however, testing of that vehicle was not possible due to problems with the testing equipment and scheduling.

Four of the cars are 1980 model year, gasoline-fueled vehicles with closed-loop, three-way catalyst systems. A fifth car, the 1980 VW Rabbit, is Diesel-fueled. The sixth car is a 1970 model year Impala without substantial control of exhaust emissions and without a catalyst.

Test Equipment

Two Clayton chassis dynamometers (Model CTE-50) were used by CARB in this program. Dynamometer number 1 was similar to the type of two-roller dynamometer used by EPA for official certification testing. Dynamometer number 2 was the same as number 1 except that it used a cogged belt to connect the (otherwise independent) rollers (see Figure 2). The higher acceleration rates required coupled rollers to prevent excessive slip between the tires and the rollers.

The sample train was modified by installing a more powerful suction pump (with output flow of about 5 CFM) in order to collect an adequate bag sample during the short (i.e. 5 to 10 seconds) acceleration tests.

The electronic actuation signal (start) for the vehicle driver was coordinated with the bag sampler and the chart recorder. The bag sampler signal had to be delayed by an amount equivalent to the exhaust sample travel time between the tailpipe and the bag intake. This coordination was found to be critical since the travel time was of the same order of magnitude as the acceleration test duration.

Table 1

Test Vehicle Descriptions

Vehicle Number	1	2	3	4	6	7
Model Year	1980	1970	1980	1980	1980	1980
Model	FORD PINTO	CHEV IMPALA	PONT. FIREBIRD	VW RABBIT	SAAB 900 TURBO	VOLVO GL
C.I.D.	140	350	305	90	121	130
No. of Cylinders	4	8	8	4	4	4
Gas / Diesel	GAS	GAS	GAS	DIESEL	GAS	GAS
Aspiration	NATURAL	NATURAL	NATURAL	NATURAL	TURBOCHARGED	NATURAL
Catalyst System	3-WAY + OXD CAT CLOSED-LOOP	NONE	3-WAY CAT CLOSED-LOOP	NONE	3-WAY CAT CLOSED-LOOP	3-WAY CAT CLOSED-LOOP
Carb / Fuel Injected	2V HOLLEY CARB	2V ROCHESTER CARB	4V ROCHESTER CARB	BOSCH FI	BOSCH FI	BOSCH FI
Air Injection ?	YES	NO	YES	NO	NO	NO
EGR ?	YES	NO	YES	NO	NO	NO
Transmission	AUTO 3-SPEED	AUTO 3-SPEED	AUTO 3-SPEED	MANUAL 5-SPEED	MANUAL 5-SPEED	AUTO 3-SPEED
Axle Ratio	3.08	2.56 *	2.56	3.90	3.89	3.73
Tire Size	B78X13	G78X15	205X15	155X13	195X15	185X14
Equivalent Test Weight (ETW) (lbs)	2875	4000	4000	2375	3125	3375
Dyno HP	10.7	12.0	10.2	6.8	11.3	12.5

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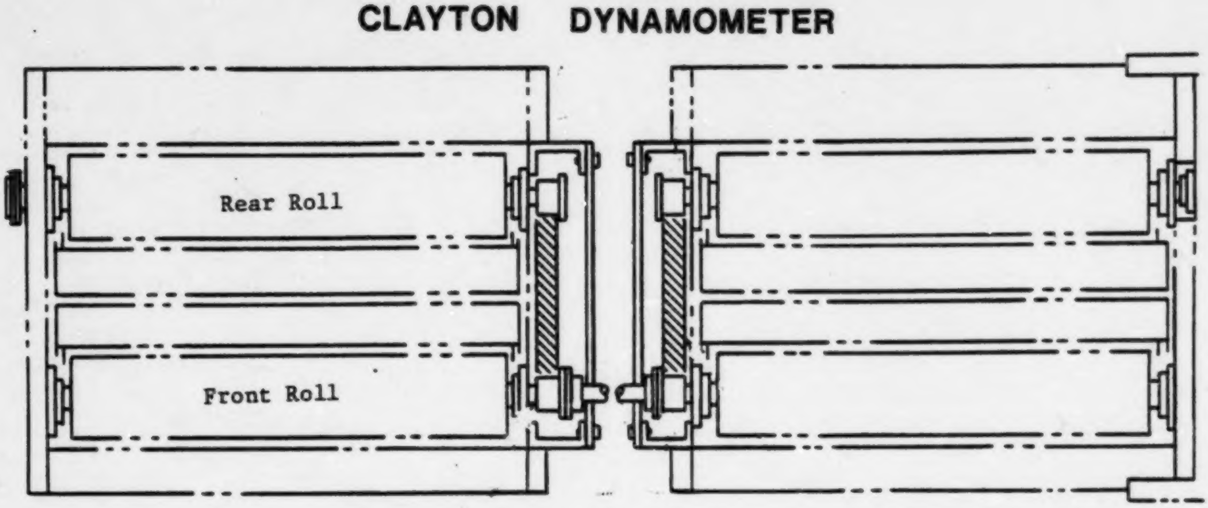
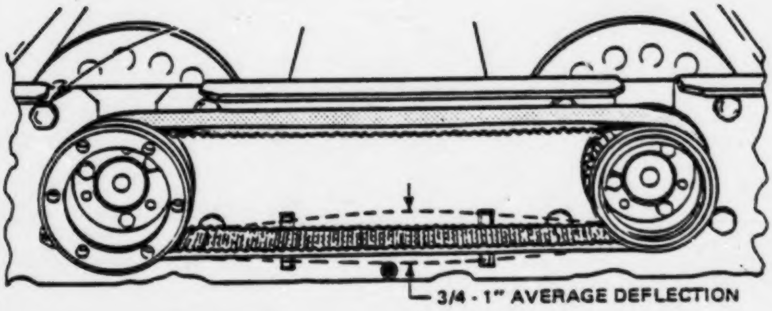
* Questionable value.

Figure 2
Dynamometer Roll Coupler


CLAYTON DYNAMOMETER
Rear Roll
Front Roll

Top View - Rolls w/Coupler Installed


3/4 - 1" AVERAGE DEFLECTION

Detail of Cogged Belt Coupler

Test Cycles

The test sequence consisted of the following steps with and without the dynamometer roller coupler installed:

1. - FTP exhaust emissions test.

2. - Acceleration test cycles as follows:

   a) 0-30 mph at constant acceleration rate of 3.0 mph/sec.

   b) 0-30 mph at constant acceleration rate of 4.0 mph/sec.

   c) 0-30 mph at constant acceleration rate of 5.0 mph/sec.

   d) 0-30 mph at constant acceleration rate of 6.0 mph/sec.

   e) 0-30 mph at wide open throttle.

   f) 0-60 mph at wide open throttle.

   g) 30-60 mph at constant acceleration rate of 3.0 mph/sec.

   h) 30-60 mph at constant acceleration rate of 4.0 mph/sec.

   i) 30-60 mph at constant acceleration rate of 5.0 mph/sec.

   j) 30-60 mph at constant acceleration rate of 6.0 mph/sec.

3. - Cold start "Unclipped" LA-4 test procedure.

4. - For Diesel powered vehicles only, measurements of opacity (i.e. smoke) during accelerations and LA-4 test cycles were performed.

Each acceleration test cycle was performed with the vehicle in a hot stabilized condition. A minimum of five minutes at 50 mph steady speed was required to assure engine temperature stability. Each vehicle was idled for no more than 10 minutes before the start of the test cycle. Otherwise, the 5 minutes of 50 mph preconditioning was repeated. Each acceleration test is an average of several repeated acceleration runs (see Appendix A). These repeated runs were all collected in one bag to ensure adequate sample size (about 3 SCF) and to minimize bag-to-bag (filling/evacuating) errors.

There is potential difficulty in using this procedure to measure emissions from an acceleration maneuver which could be only 5 seconds long. That difficulty is determining when to collect the exhaust gas. CARB explains (reference 27):

> [The CARB] technical staff had to calculate the exact exhaust sample transit time for each vehicle and to automate the bag filling mechanism to ensure that the samples collected represented the acceleration modes only. The shut-off mechanism had to be triggered manually when the desired speed had been attained. The shut-off mechanism continued automatically to allow for the appropriate sample transit time. Obviously, the driver's reactions are not instantaneous. Hypothetically, if it took 1 to 2 seconds for a driver to react, up to 40% increase (2 seconds - 5 second test) in the sample collection time could result.

This error would cause deceleration exhaust emissions to be collected in the CVS bags since the driver would immediately brake the vehicle in preparation for repeated acceleration. Deceleration exhaust emissions for HC and CO can be orders of magnitude higher than acceleration exhaust emissions due to incomplete combustion (see Reference 26). Therefore, the net error may exceed the value of the measured pollutants.

The "unclipped" LA-4 driving cycle is the "Department of Health, Education, and Welfare Urban Dynamometer Driving Schedule" published in the Federal Register, Volume 35, No. 136, dated July 15, 1970. By omitting (clipping out) acceleration modes higher than 3.3 miles per hour per second, the unclipped LA-4 becomes the clipped LA-4 or the CVS-72 driving cycle.

Summary of the Test Results

The regulated gaseous emissions (in grams per mile) and fuel economy (in miles per gallon) data generated in this test program can be found in Appendix A. Opacity, sulfate, and total particulate test data are presented in Appendix C.

In comparing the emissions (in grams per mile) produced by accelerating from 0 to 30 mph at a rate of 3 mph per second to those produced during an acceleration of 5 mph per second, we find that the vehicle had to travel about 67% farther to reach the terminal speed (30 mph) at the lower acceleration rate than at the higher. Thus, even if a vehicle emitted a pollutant at a lower rate at 3 mph/sec than at 5 mph/sec, the total emissions during the various acceleration cycles might be ordered differently. We, therefore, calculated the average total emissions (in grams) for a single acceleration (i.e. maneuver) by multiplying the emissions per mile (from Appendix A) by the average distance for that test (i.e., the "total distance" divided by "number of accelerations per test"). These calculated values appear in Appendix B. We similarily computed the average amount of fuel consumed for each acceleration.

For the FTP test data from Appendix A and the acceleration test cycle data from Appendix B, we calculated means, standard deviations, and coefficients of variation (C.O.V. = "standard deviation" divided by "mean" x 100%). (See Appendix D.) Histograms were drawn using the means calculated in Appendix D (see Appendixes F, G and H).

Effects of Clipped and Unclipped Test Cycles:

The percent changes in the average emissions and fuel consumption between the test results of the "unclipped" and "clipped" FTP cycles appear in Table 2. Neither the data in Table 2 nor the graphs in Appendix F-1 indicate a consistent measurable effect between the two cycles either on emissions or

Table 2

(Unclipped vs Clipped)

Effect (Δ%‡) of Higher Acceleration Rates on FTP Emissions
(grams per mile) and Fuel Consumption *(gallons per mile)*

Vehicle	------- With Dyno Rolls Uncoupled -------				--------- With Dyno Rolls Coupled ---------			
	Δ% HC	Δ% CO	Δ% NOx	Δ% Fuel Consumed	Δ% HC	Δ% CO	Δ% NOx	Δ% Fuel Consumed
Pinto	-6.5% (e)	3.2% (g)	-2.1% (f)	4.2% (f)	8.0% (f)	8.3% (d)	-0.7% (g)	1.8% (e)
Impala	4.3% (g)	-7.2% (f)	-15.6% (f)	-0.3% (g)	2.2% (g)	0.2% (g)	0.9% (g)	0.0% (g)
Firebird	-6.0% (f)	3.3% (g)	-6.1% (f)	-0.9% (f)	-45.1% (a)	-18.1% (e)	7.6% (b)	-1.5% (f)
Rabbit	16.6% (f)	-1.8% (g)	5.6% (c)	0.0% (g)	18.0% (g)	5.5% (g)	0.0% (g)	-2.3% (f)
Saab	-13.5% (f)	-7.5% (f)	2.1% (g)	1.4% (g)	-19.8% (e)	-9.1% (f)	-17.7% (d)	1.3% (g)
Volvo	11.9% (f)	7.0% (g)	14.9% (f)	2.9% (e)	-11.9% (g)	-6.1% (g)	-2.3% (g)	3.0% (g)

For the four 1980 Model Year, Gasoline-Fueled Cars:

Mean Δ%:	-3.5%	1.5%	2.2%	1.9%	-17.2%	-6.2%	-3.3%	1.2%
St. Dev:	10.8	6.3	9.1	2.2	22.0	11.0	10.6	1.9

---

‡ $\Delta\% = \frac{\text{Unclipped - Clipped}}{\text{Clipped}} \times 100$

(a) The sample means used are distinct at a 99% confidence level.
(b) The sample means used are distinct at a 98% confidence level.
(c) The sample means used are distinct at a 95% confidence level.
(d) The sample means used are distinct at a 90% confidence level.
(e) The sample means used are distinct at an 80% confidence level.
(f) The sample means used are distinct at only a 50% confidence level.
(g) The sample means used are distinct at confidence levels less than 50%.

See graphs in Appendix F-1.

on fuel consumption. Adding to the difficulty of detecting a trend is the small number of FTPs performed in each sample, thus reducing the confidence level (using Student's t-test) at which we can even determine whether a given percent change is positive, negative, or zero.

Effects of Coupling Dynamometer Rollers during the FTP:

The percent changes in the average emission and fuel consumption between the test results with the dynamometer rollers coupled and uncoupled appear in Table 3. The changes are illustrated in Appendix F-1.

All the gasoline-fueled cars exhibited increases in HC emissions on both the "clipped" and "unclipped" FTP cycles when the rollers were coupled. If we examine the results from only the 1980 model year, gasoline-fueled cars, we find the mean change to be 58.8% with a standard deviation of 71.3 for the currently used "clipped" FTP, and 26.1% and 21.7 for the "unclipped." The Firebird exhibited a substantially higher percent change in HC than the other vehicles. The VW Rabbit Diesel appeared to exhibit a decrease in HC emissions when the rollers were coupled; however, the large test-to-test variability (see Table D4 of Appendix D) makes it difficult to have a high degree of statistical confidence in that decrease actually being a trend.

All the gasoline-fueled cars also exhibited increases in CO emissions when the dynamometer rollers were coupled. The CO emissions of the 1980 Pontiac Firebird, like its HC emissions, exhibited a percent increase with the rollers coupled greater than the other four gasoline-fuel vehicles. The VW Diesel Rabbit exhibited a decrease in CO emissions when the rollers were coupled.

All the gasoline-fueled, 1980 cars exhibited apparent increases in NOx emissions on the "clipped" FTP test cycle when the dynamometer rollers were coupled. However, if we use the coefficient of variation (calculated in Appendix D) as a measure of test-to-test variability, we find that in half of those cases the test-to-test variability exceeds the apparent changes among the means. On the "unclipped" FTP cycle, all the 1980 model year,

Table 3

(Coupled vs Uncoupled)

Effect (Δ%[‡]) of Coupling Dynamometer Rollers on FTP Emissions *(grams per mile)* and Fuel Consumption *(gallons per mile)*

	"Clipped" FTP				"Unclipped" FTP			
Vehicle	Δ% HC	Δ% CO	Δ% NOx	Δ% Fuel Consumed	Δ% HC	Δ% CO	Δ% NOx	Δ% Fuel Consumed
Pinto	13.9% (a)	27.8% (a)	4.3% (e)	-20.5% (a)	31.4% (d)	34.2% (a)	5.8% (c)	-22.3% (a)
Impala	4.1% (f)	18.2% (b)	-18.8% (e)	2.4% (e)	-2.0% (g)	27.6% (a)	-3.0% (g)	2.7% (d)
Firebird	164.6% (a)	103.0% (a)	4.4% (f)	-16.5% (a)	54.6% (b)	60.8% (d)	19.6% (b)	-17.0% (a)
Rabbit	-17.3% (f)	-12.8% (c)	-1.0% (g)	1.2% (g)	-16.3% (f)	-6.3% (g)	-6.3% (f)	-1.1% (g)
Saab	18.5% (f)	23.8% (d)	15.2% (e)	-1.9% (e)	9.7% (f)	21.8% (e)	-7.2% (f)	-1.9% (g)
Volvo	38.1% (f)	38.9% (e)	24.1% (d)	3.7% (f)	8.8% (e)	21.8% (e)	5.6% (g)	3.8% (f)

For the four 1980 Model Year, Gasoline-Fueled Cars:

Mean Δ%:	58.8%	48.4%	12.0%	-8.8%	26.1%	34.6%	6.0%	-9.4%
St. Dev:,	71.3	37.0	9.6	11.5	21.7	18.4	10.9	12.3

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‡ $$\Delta\% = \frac{\text{Coupled - Uncoupled}}{\text{Uncoupled}} \times 100$$

(a) The sample means used are distinct at a 99% confidence level.
(b) The sample means used are distinct at a 98% confidence level.
(c) The sample means used are distinct at a 95% confidence level.
(d) The sample means used are distinct at a 90% confidence level.
(e) The sample means used are distinct at an 80% confidence level.
(f) The sample means used are distinct at only a 50% confidence level.
(g) The sample means used are distinct at confidence levels less than 50%.

See graphs in Appendix F-1.

naturally aspirated, gasoline-fueled cars (i.e. Pinto, Firebird, and Volvo) exhibited trends (exceeding the 98% confidence level) indicating increasing NOx (averaging 10.3% with a standard deviation of 8.0) when the rollers were coupled.

The fuel consumption (gallons per mile) data are mixed. However, both the Pinto and the Firebird (vehicles 1 and 3) exhibit the trend (at the 99% confidence level) of decreasing fuel consumption associated with coupling the dynamometer rollers. The other four vehicles exhibit smaller, less certain fuel economy effects. An earlier EPA study (reference number 18) found that a 1976 model year Mercury Montego exhibited a 4% increase in fuel consumption with the rollers coupled when tested at a steady state 50 mph.

A Ford study (reference number 8), suggests that coupling the dynamometer rollers results in increasing HC, CO, and fuel consumption on the FTP cycle for a fleet of five cars and five trucks. The in changes NOx emissions in that Ford study were mixed.

Effects of an Unclipped Test Cycle and Coupled Dynamometer Rolls:

The data in Table 4 summarizes the per cent changes observed in the average emissions and fuel consumption between the standard (i.e. clipped and uncoupled) FTP and the "unclipped" FTP with coupled dynamometer rollers. It can be thought of as the difference between the current procedure and a possibly improved procedure.

The 1980 model year, gasoline-fueled vehicles exhibited increases in HC and CO emissions over the standard FTP, but the changes in NOx emissions were mixed.

The 1980 Pinto and the 1980 Firebird both exhibited increases in fuel economy (i.e. decreases in fuel consumption). However, the other four vehicles showed mixed results.

Table 4

(Coupled-Unclipped vs Uncoupled-Clipped)

Effect ($\Delta\%^*$) of Both Coupling the Dynamometer Rollers and Higher Accelerations on FTP Emissions and Fuel Consumption

Vehicle	Δ% HC	Δ% CO	Δ% NOx	Δ% Fuel Consumed
Pinto	22.9% (d)	38.5% (c)	3.6% (e)	-19.0% (c)
Impala	2.2% (g)	18.4% (c)	-18.1% (f)	2.4% (e)
Firebird	45.4% (b)	66.2% (b)	12.3% (d)	-17.8% (a)
Rabbit	-2.5% (g)	-8.0% (f)	-1.0% (g)	-1.1% (g)
Saab	-5.0% (g)	12.6% (f)	-5.2% (g)	-0.5% (g)
Volvo	21.7% (d)	30.4% (c)	21.3% (a)	6.8% (f)

For the four 1980 Model Year, Gasoline-Fueled Cars:

	Δ% HC	Δ% CO	Δ% NOx	Δ% Fuel Consumed
Mean Δ%:	21.2%	36.9%	8.0%	-7.6%
St. Dev:	20.6	22.3	11.4	12.8

$$* \quad \Delta\% = \frac{(\text{Coupled,Unclipped}) - (\text{Uncoupled,Clipped})}{(\text{Uncoupled,Clipped})} \times 100$$

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(b) The sample means used are distinct at a 98% confidence level.
(c) The sample means used are distinct at a 95% confidence level.
(d) The sample means used are distinct at a 90% confidence level.
(e) The sample means used are distinct at an 80% confidence level.
(f) The sample means used are distinct at only a 50% confidence level.
(g) The sample means used are distinct at confidence levels less than 50%.

See graphs in Appendix F-1.

Effects of Coupling Dynamometer Rollers during the Acceleration Cycles:

No consistent relationship between coupling the dynamometer rollers and the test results was apparent. However, some individual vehicles appeared to display their own individual relationship. For example, coupling the dynamometer rollers resulted in:

1. The Impala and the Volvo emitting higher amounts of HC, but the Pinto (during throttled accelerations from 0 to 30 mph) emitting less HC.

2. Increased CO emissions for the Firebird but reduced CO emissions for the Saab and Volvo.

3. Decreases in NOx emissions for the Impala and Volvo, but mixed results for the other cars.

Thus the test results indicated that the effects on emissions and fuel economy of coupling the dynamometer rollers were strongly vehicle dependent.

Care should be taken in using the histograms in Appendixes G and H since they are based on the mean values, and, hence, may obscure the existence of a wide range in the variable. A case in point is the 1970 Impala (vehicle 2). One might infer from the emissions data (Appendixes A and B) that a significant change occured between test 4 and 5; however, we cannot document any such change. We did perform separate calculations (Appendix D) based on that inference.

Effects of Acceleration Rates on Emissions and Fuel Economy:

No consistent trend is apparent between the acceleration rate and either any of the average total emissions (Appendix G) or any of the average emissions per mile (Appendix H). However, each of the six test vehicles exhibited its own unique reaction to varing acceleration rates. For example, the 1980 Firebird (vehicle 3):

1. Exhibited increasing HC (both grams per mile and total grams per maneuver) as the acceleration rate increased.

2. Exhibited increasing CO (both grams per mile and total grams per maneuver) as the acceleration rate increased except for the 0 to 30 mph acceleration modes with the dynamometer rollers not coupled in which CO was minimized for the 4 mph/sec. acceleration and increased with higher acceleration rates.

3. Exhibited, for emissions measured in grams per mile, increasing NOx as the acceleration rate increased in the 0 to 30 mph mode, and decreasing NOx as the acceleration rate increased in the 30 to 60 mph mode. However, for emissions measured in total grams per maneuver, NOx increased with increasing accelerations to a maximum occuring at an acceleration between 4 and 5 mph/sec followed by decreasing NOx at higher accelerations.

4. Exhibited, for fuel consumption measured in gallons per mile, increasing fuel consumption in the 0 to 30 mph mode with increasing acceleration rates. Almost no effect was seen in the 30 to 60 mph mode for fuel consumption measured in total gallons per maneuver, and the fuel consumption in gallons per mile tended to increase as the acceleration rate increased.

The other test vehicles exhibited similar, but different trends, as illustrated in the graphs in Appendixes F-2 and F-3.

Comparisons Among the Test Vehicles:

On the four urban cycles (both the "clipped" and "uncilipped" FTP performed both with and without the dynamometer rollers coupled), the mean emissions (Appendix D) of the 1980 model year, gasoline-fueled cars (Pinto, Firebird, Saab 900 Turbo, and Volvo) exhibited (relative to the 1970 model year Impala):

1. HC reductions between 83% to 96%,
2. CO reductions between 82% to 93%, and
3. NOx reductions between 76% to 90%.

The emissions data generated during the acceleration cycles is illustrated in Appendixes F-2 (grams per mile basis) and F-3 (total grams per maneuver). While comparisons of the acceleration data are less-clear cut than comparisons of the FTP data, the following trends are apparent:

1. The NOx emissions of the 1970 Impala were greater than those of the four 1980 gasoline-fueled cars. During non-WOT accelerations, the 1970 vehicle emitted mroe than twice the amount of NOx as did the 1980 gasoline-fueled cars.
2. The HC and CO emissions of the 1970 Impala exceeded those of the Pinto, Saab, and Volvo. However, the Firebird's emissions were not consistently less than the Impala's emissions.

Effects on Opacity, Sulfates, and Total Particulates:

The percent opacity (i.e. smoke) of the VW Diesel Rabbit's exhaust was measured using a Berkeley Smoke Meter and appears in Appendix C. The data indicate an increase in opacity number (more visible smoke) with the increase in acceleration rate. Opacity numbers obtained with the dynamometer rollers coupled were slighly (0% to 6%) lower than those observed with the rollers not coupled.

The data in Appendix C also show that approximately 50% of the total particulates emitted from 1980 model year, gasoline-powered vehicles are sulfate compared with less than 2% for the diesel-powered vehicle. Total particulates from the Diesel-powered vehicle were two orders of magnitude higher than those of the 1980 model year, gasoline-powered vehicles. The amount of sulfate emissions by weight was less than 15 mg/mi for all vehicles. There is no indication of any trend relating either sulfate or particulate emissions to either higher FTP acceleration or coupling the dynamometer rollers.

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Appendix A

Regulated Gaseous Emissions (g/mi) and Fuel Economy Data During FTP and Acceleration Cycles.

"TEST" - This is the test number arbitrarily assigned to the test sequence.

"Dyno Clpd ?" - This is a yes/no field indicating whether the dynamometer rollers were coupled.

Table A1

Measured Test Results -- Basic FTP Cycle

VEHICLE	Test #	Dyno Clpd	---- HC	Emissions (g/mi) CO	CO_2	---- NO_x	F.E. (mpg)
Pinto	2	Yes	0.398	5.99	502	0.76	17.3
	4	Yes	0.425	6.66	502	0.72	17.3
	5	Yes	0.389	6.93	506	0.75	17.1
	6	Yes	0.407	6.27	520	0.69	16.7
	7*	Yes	N/A	N/A	N/A	N/A	N/A
	10	No	0.365	4.79	618	0.71	14.2
	11	No	0.346	5.32	675	0.69	13.0
Impala	1	Yes	4.807	43.18	545	4.81	14.1
	2	Yes	4.570	42.79	529	4.67	14.5
	3	Yes	4.293	49.48	578	4.42	13.3
	4	Yes	4.905	42.97	539	4.79	14.3
	5	Yes	4.659	43.81	536	4.89	14.3
	6	Yes	4.848	44.52	554	4.93	13.9
	10	No	4.619	39.32	545	6.60	14.3
	11	No	4.376	35.90	540	5.10	14.5
Firebird	1	No	0.253	4.23	818	0.61	10.7
	2	No	0.357	3.99	814	0.63	10.8
	3	No	0.275	3.59	792	0.53	11.1
	4*	No	N/A	N/A	N/A	N/A	N/A
	5	No	0.291	3.56	815	0.51	10.8
	10	Yes	0.790	7.44	672	0.60	12.9
	11	Yes	0.766	8.16	663	0.59	13.1
Diesel Rabbit	10	Yes	0.379	1.47	269	1.46	37.3
	11	Yes	0.479	1.39	281	1.53	35.8
	12	Yes	0.697	1.56	273	1.48	36.7
	17	No	0.611	1.69	265	1.50	37.7
	18	No	0.643	1.69	276	1.52	36.3
Saab	2	No	0.340	2.73	478	1.02	18.3
	3	No	0.277	2.44	473	0.89	18.6
	7	Yes	0.403	3.29	465	1.08	18.8
	8	Yes	0.328	3.11	466	1.12	18.8
Volvo	5	No	0.157	2.25	446	0.70	19.7
	6	No	0.179	2.46	456	0.71	19.3
	7*	No	N/A	N/A	N/A	N/A	N/A
	8	Yes	0.268	3.63	469	0.92	18.6
	9	Yes	0.196	2.91	463	0.83	19.0

---

* DESIGNATES VOID TEST.

Table A2

Measured Test Results -- Unclipped FTP Cycle

VEHICLE	Test #	Dyno Clpd	---- Emissions	(g/mi)		----	F.E. (mpg)
			HC	CO	CO_2	NO_x	
Pinto	8	Yes	0.404	6.85	513	0.72	16.9
	9	Yes	0.470	7.15	518	0.73	16.7
	12	No	0.328	5.20	670	0.69	13.1
	13	No	0.337	5.23	673	0.68	13.0
Impala	7	Yes	4.042	45.73	556	4.95	13.9
	8	Yes	4.796	45.28	535	4.84	14.3
	9	Yes	4.951	42.60	551	4.59	14.0
	12	No	4.411	35.68	551	5.28	14.3
	13	No	4.971	34.11	538	4.60	14.6
Firebird	7	No	0.283	3.78	804	0.55	10.9
	8	No	0.270	4.16	797	0.52	11.0
	9*	No	N/A	N/A	N/A	N/A	N/A
	12	Yes	0.408	5.81	671	0.64	13.0
	14	Yes	0.447	6.96	651	0.64	13.4
Diesel Rabbit	13	Yes	0.506	1.40	264	1.43	38.0
	14	Yes	0.717	1.71	272	1.56	36.8
	15	No	0.665	1.40	261	1.58	38.4
	16	No	0.797	1.92	281	1.61	35.6
Saab	5	No	0.293	2.24	476	0.95	18.5
	6	No	0.241	2.54	491	1.00	17.9
	9	Yes	0.285	3.08	486	0.96	18.1
	10	Yes	0.301	2.74	463	0.85	19.0
Volvo	3	No	0.181	2.25	466	0.89	18.9
	4	No	0.195	2.79	462	0.73	19.0
	10	Yes	0.208	3.00	505	0.86	17.4
	11	Yes	0.201	3.14	459	0.85	19.1

---

* DESIGNATES VOID TEST.

Table A3

Measured Test Results -- Wide Open Throttle Accelerations

			************ 0 - 30 mph at WOT ************						************ 0 - 60 mph at WOT ************					
			--EMISSIONS (g/mi)--						--EMISSIONS (g/mi)--					
VEHICLE	TEST #	DYNO CPLD ?	HC	CO	NOx	F.E. (mpg)	TOTAL DIST. (mi)	ACCELS PER TEST	HC	CO	NOx	F.E. (mpg)	TOTAL DIST. (mi)	ACCELS PER TEST
Pinto	1	Yes	1.22	114.75	3.28	4.8	0.246	12	1.43	43.59	2.29	8.3	0.859	6
	2	Yes	0.96	95.17	3.52	4.5	0.220	8	1.48	49.24	2.01	8.0	0.638	3
	3	Yes	1.80	124.67	4.01	4.4	0.218	8	1.09	43.95	2.26	8.5	0.654	3
	4	Yes	1.03	81.06	5.30	6.6	0.213	8	1.18	54.26	3.08	12.0	0.568	3
	5	Yes	1.55	138.70	4.34	3.9	0.201	8	1.21	49.77	2.80	7.7	0.594	3
	6	No	2.75	184.90	3.71	3.4	0.112	13	0.94	42.28	2.13	9.1	0.493	2
	7	No	1.68	135.35	1.95	4.6	0.140	13	0.84	46.83	2.14	8.8	0.671	3
Impala	1	Yes	26.56	19.84	7.82	3.4	0.231	12	13.42	0.74	7.63	7.1	0.715	6
	2	Yes	28.18	25.80	8.69	3.3	0.192	10	12.69	1.24	7.52	7.2	0.602	5
	3	Yes	24.95	25.30	7.84	3.4	0.177	10	12.39	2.88	7.71	6.9	0.552	5
Firebird	1	No												
	2	No	136.00	812.07	0.53	2.6	0.179	6	57.78	597.81	1.55	3.7	0.441	3
	3	No	130.85	630.98	0.79	2.7	0.178	6	51.90	612.25	1.62	3.8	0.455	3
	4	Yes	105.84	696.38	0.46	3.1	0.190	6	39.51	518.20	0.66	4.7	0.540	3
	5	Yes	104.46	715.71	0.49	3.3	0.193	6	60.51	558.12	1.03	4.0	0.342	2
	6	Yes	113.06	749.62	0.48	3.1	0.163	5	46.26	513.95	1.34	4.5	0.495	3
Rabbit	1	Yes	3.45	11.12	3.77	9.5	0.229	6	5.26	11.15	2.50	13.4	0.500	2
	2	Yes	7.58	10.15	3.49	9.7	0.175	5	6.28	10.40	2.08	14.1	0.517	2
	3	Yes	7.27	10.86	3.66	9.6	0.172	5	6.37	10.54	2.29	13.9	0.492	2
	4	No	4.44	8.91	3.66	11.5	0.193	5	5.79	9.39	2.09	15.5	0.516	2
	5	No	8.00	10.97	3.64	10.1	0.192	6	6.46	11.19	2.20	13.7	0.496	2
Saab	1	No	0.36	139.93	1.87	5.1	0.147	8	0.92	24.45	3.08	7.2	0.389	3
	2	No	0.19	160.30	2.95	4.8	0.137	7	1.24	25.77	3.31	7.9	0.449	3
	3	No	0.39	131.12	7.65	3.3	0.131	7	1.44	9.97	3.56	6.5	0.383	3
	4	Yes	39.31	138.59	4.07	3.9	0.146	7	14.96	8.62	3.12	6.4	0.476	3
	5	Yes	1.35	143.05	5.82	4.0	0.148	7	1.01	42.14	1.20	14.0	0.377	3
Volvo	1	No	1.87	6.17	4.31	5.3	0.170	8	0.24	16.64	5.63	6.8	0.425	3
	2	No	0.62	4.59	3.25	5.2	0.163	6	0.78	10.65	4.52	7.2	0.459	3
	3	No	0.51	2.94	3.42	5.9	0.206	7	0.49	4.81	2.93	7.2	0.457	3
	4	No	0.56	5.00	3.03	5.6	0.175	7	0.90	12.99	5.14	6.9	0.431	3
	5	Yes	0.96	7.52	4.96	4.0	0.176	7	0.99	12.14	4.78	6.1	0.496	3
	6	Yes	0.84	5.33	4.54	4.6	0.175	7	0.72	8.42	4.71	6.6	0.506	3

Table A4

Measured Test Results -- Accelerations from 0 to 30 MPH

			********* 0 - 30 mph at 3 mph/sec *********						******** 0 - 30 at 4 mph/sec *************					
			--EMISSIONS (g/mi)--						--EMISSIONS (g/mi)--					
VEHICLE	TEST #	DYNO CLPD ?	HC	CO	NOx	F.E. (mpg)	TOTAL DIST. (mi)	ACCELS PER TEST	HC	CO	NOx	F.E. (mpg)	TOTAL DIST. (mi)	ACCELS PER TEST
Pinto	1	Yes	0.22	3.51	2.13	9.5	0.308	6	0.66	6.97	2.43	8.5	0.313	8
	2	Yes	0.52	8.35	2.48	7.9	0.268	5	1.04	27.11	7.62	3.8	0.272	7
	3	Yes	0.28	4.54	3.22	6.4	0.246	5	0.74	13.95	4.30	5.9	0.252	6
	4	Yes	0.69	5.59	3.87	9.4	0.257	5	0.89	26.62	6.02	7.7	0.221	6
	5	Yes	1.95	40.53	4.48	5.5	0.194	4	1.19	38.52	5.67	5.1	0.228	6
	6	No	2.01	23.62	3.81	6.6	0.240	5	1.97	41.95	4.50	5.9	0.224	6
	7	No	1.33	19.32	4.22	5.7	0.229	5	0.95	50.64	5.59	4.2	0.195	6
Impala	1	Yes	9.43	66.88	24.06	5.7	0.258	6	15.53	98.70	38.67	3.6	0.229	6
	2	Yes	28.41	79.04	26.26	4.3	0.280	6	10.07	84.31	27.22	4.8	0.262	7
	3	Yes	9.65	82.48	28.26	4.8	0.236	5	9.25	68.13	32.01	4.7	0.240	6
	4	Yes	10.57	82.73	27.61	4.9	0.233	5	11.39	112.67	29.93	4.1	0.235	7
	5	Yes	10.37	84.64	23.34	4.9	0.238	5	11.48	65.28	34.66	3.7	0.203	6
	6	Yes	13.42	192.40	30.53	3.4	0.181	4	14.11	195.65	35.71	2.9	0.199	6
	7	Yes	11.22	127.71	28.17	4.2	0.226	5	12.75	217.56	30.97	3.4	0.199	6
	8	No	10.96	93.87	28.69	4.6	0.186	4	11.31	85.11	37.87	3.8	0.198	6
	9	No	10.52	89.09	31.56	4.3	0.181	4	10.80	66.88	36.46	3.8	0.200	6
Firebird	1	No												
	2	No	1.14	144.60	2.33	6.8	0.188	4	1.02	50.58	6.48	5.2	0.186	6
	3	No	0.66	2.81	2.50	7.4	0.180	4	0.78	16.72	7.60	4.7	0.166	6
	4	Yes	7.94	38.69	5.69	6.0	0.183	4	45.15	329.32	6.97	3.4	0.172	5
	5	Yes	0.28	4.83	2.29	8.5	0.199	4	0.46	37.28	6.90	5.4	0.195	6
	6	Yes	0.47	4.04	3.74	6.4	0.181	4	0.34	37.92	9.32	4.8	0.180	5
Rabbit	1	Yes	7.91	21.41	7.21	5.4	0.177	2	13.48	21.65	5.44	6.1	0.193	5
	2	Yes	10.16	12.53	4.65	8.8	0.185	4	10.88	14.79	4.39	8.3	0.190	5
	3	Yes	10.05	13.32	4.88	9.3	0.188	4	3.28	13.69	4.51	9.3	0.200	5
	4	No	6.72	13.67	4.97	9.0	0.170	4	5.90	14.01	3.98	8.9	0.183	5
	5	No	6.16	14.50	5.06	8.5	0.179	4	7.65	23.57	5.60	5.6	0.178	5
Saab	1	No	0.30	13.74	6.45	6.8	0.214	5	0.85	131.66	6.89	4.6	0.159	5
	2	No	0.61	113.89	9.32	5.9	0.208	5	0.84	133.37	16.72	6.2	0.175	6
	3	No	0.77	21.18	9.72	5.7	0.177	4	0.47	95.27	16.00	4.3	0.187	6
	4	Yes	0.31	15.27	9.12	4.8	0.164	4	1.47	31.73	9.54	3.9	0.170	5
	5	Yes	0.32	21.38	5.07	4.9	0.173	4	1.37	21.14	8.12	3.8	0.164	5
Volvo	1	No	1.07	28.67	8.46	5.6	0.170	4	1.30	38.73	13.05	4.0	0.169	5
	2	No	1.25	44.41	9.08	5.8	0.184	4	1.24	36.41	10.41	4.3	0.172	5
	3	No	1.07	39.28	8.66	5.7	0.178	4	1.39	41.37	12.24	4.5	0.175	5
	4	No	0.71	20.06	5.89	5.8	0.182	4	0.94	19.38	7.85	4.0	0.169	5
	5	Yes	1.01	24.05	8.10	5.2	0.188	4	1.36	25.22	8.89	3.8	0.187	5
	6	Yes	0.56	3.68	5.04	5.2	0.186	4	1.64	25.05	4.64	3.6	0.177	5

Table A4 (Continued)

Measured Test Results -- Accelerations from 0 to 30 MPH (Continued)

			******** 0 - 30 at 5 mph/sec *************						******** 0 - 30 at 6 mph/sec ************					
	TEST #	DYNO CLPD	--EMISSIONS (g/mi)--				TOTAL DIST.	ACCELS PER	--EMISSIONS (g/mi)--				TOTAL DIST.	ACCELS PER
VEHICLE		?	HC	CO	NOx	F.E. (mpg)	(mi)	TEST	HC	CO	NOx	F.E. (mpg)	(mi)	TEST
Pinto	1	Yes	0.54	7.88	2.74	8.0	0.328	10						
	2	Yes	0.95	55.89	4.80	4.6	0.252	9						
	3	Yes	1.31	78.21	5.31	4.1	0.268	9						
	4	Yes	1.88	94.25	8.97	5.3	0.206	7	1.95	99.69	6.46	6.1	0.217	8
	5	Yes	1.71	76.86	8.51	3.6	0.205	7						
	6	No	1.26	50.58	5.99	4.3	0.182	7	0.97	49.30	3.49	6.5	0.268	8
	7	No	1.99	126.68	7.01	3.1	0.169	6	3.87	157.72	6.84	3.1	0.149	7
Impala	1	Yes	17.01	64.37	37.90	4.0	0.184	6						
	2	Yes	11.08	110.28	30.34	3.9	0.250	9						
	3	Yes	12.52	80.30	29.73	3.8	0.250	9						
	4	Yes	11.82	85.05	25.17	4.2	0.242	9						
	5	Yes	12.08	144.81	30.93	3.5	0.215	8	17.50	391.01	32.66	2.4	0.211	9
	6	Yes	22.29	628.47	36.84	1.9	0.168	6	18.87	364.14	36.68	2.2	0.207	9
	7	Yes	15.63	301.37	36.88	2.6	0.188	7	17.52	455.13	32.24	2.3	0.205	9
	8	No	12.13	142.51	36.27	3.5	0.199	7	14.47	281.89	39.31	2.7	0.179	8
	9	No	15.88	309.74	36.16	2.5	0.190	7	27.31	895.99	38.32	1.5	0.163	8
Firebird	1	No												
	2	No	7.67	150.20	9.07	3.6	0.172	7	15.99	314.14	10.35	3.5	0.185	8
	3	No	9.19	189.74	14.00	3.2	0.145	6	56.47	511.76	5.80	2.8	0.158	7
	4	Yes	101.22	725.04	1.62	2.7	0.192	6	103.91	602.19	0.58	3.2	0.245	8
	5	Yes	1.94	249.72	10.24	3.8	0.187	7	8.98	313.73	7.56	4.0	0.212	8
	6	Yes	23.48	415.44	13.50	2.6	0.149	5	62.01	641.45	7.84	2.3	0.159	5
Rabbit	1	Yes	13.12	20.10	5.56	6.3	0.268	7						
	2	Yes	3.41	10.23	2.60	12.9	0.246	7						
	3	Yes	12.32	17.19	1.85	7.8	0.215	6						
	4	No	5.82	15.83	3.96	8.4	0.202	6						
	5	No	8.47	30.10	6.23	4.9	0.175	6						
Saab	1	No	5.55	100.66	8.44	2.9	0.141	6	0.83	71.62	8.52	3.2	0.173	8
	2	No	4.72	136.92	11.79	2.4	0.160	7	4.40	86.87	11.50	2.7	0.173	7
	3	No	1.65	117.26	27.54	2.5	0.157	6	3.63	79.62	17.53	2.5	0.158	7
	4	Yes	2.22	96.41	12.00	2.5	0.167	6	3.58	92.86	12.02	2.5	0.160	6
	5	Yes	2.57	94.21	9.36	2.9	0.192	6	6.73	39.45	11.55	2.3	0.161	7
Volvo	1	No	2.91	66.34	20.52	3.0	0.165	6	2.25	56.25	19.36	3.0	0.166	7
	2	No	0.61	3.88	8.27	4.7	0.193	6	0.88	8.78	8.38	4.6	0.189	6
	3	No	0.97	13.44	11.08	4.5	0.194	6	0.86	13.35	10.80	5.1	0.218	7
	4	No	1.86	29.85	5.55	3.0	0.156	6	1.59	16.82	7.51	2.9	0.169	7
	5	Yes	0.94	5.74	4.66	3.1	0.168	5	1.42	19.37	6.85	3.8	0.200	6
	6	Yes	2.26	40.78	10.50	2.8	0.157	5	2.51	38.99	10.31	2.9	0.190	6

Table A5

Measured Test Results -- Accelerations from 30 to 60 MPH

VEHICLE	TEST #	DYNO CLPD ?	********* 30 - 60 mph at 3 mph/sec ********						******** 30 - 60 at 4 mph/sec ************					
			--EMISSIONS (g/mi)--						--EMISSIONS (g/mi)--					
			HC	CO	NOx	F.E. (mpg)	TOTAL DIST. (mi)	ACCELS PER TEST	HC	CO	NOx	F.E. (mpg)	TOTAL DIST. (mi)	ACCELS PER TEST
Pinto	1	Yes	0.23	27.20	2.09	13.0	0.882	5	0.43	30.20	1.38	12.6	1.059	8
	2	Yes	0.63	33.22	1.26	11.1	0.794	4	0.66	23.73	1.15	11.4	0.829	4
	3	Yes	0.84	24.16	1.35	12.0	0.993	5						
	4	Yes												
	5	Yes	1.18	42.15	2.38	7.3	0.550	3	0.92	30.78	1.64	9.7	0.715	4
	6	No	0.47	31.93	1.65	12.5	0.751	4	0.59	27.74	1.35	13.0	0.910	5
	7	No	0.43	30.90	1.12	12.3	0.714	4	0.68	26.75	1.33	12.2	0.884	5
Impala	1	Yes	6.96	7.12	7.33	9.8	0.818	6	7.58	1.62	6.10	11.8	0.712	6
	2	Yes	6.49	5.08	6.77	10.8	0.805	5	8.30	0.89	5.88	11.4	0.863	7
	3	Yes	6.84	3.42	6.09	10.8	0.712	5	6.67	8.58	4.16	11.5	0.714	6
	4	Yes	7.58	4.12	8.21	9.5	0.685	5	9.71	0.0	6.49	11.0	0.680	6
	5	Yes	8.07	266.28	9.29	5.1	0.722	5	9.53	388.58	6.37	4.7	0.707	6
	6	Yes	5.18	209.95	7.22	6.9	0.817	6	7.60	347.29	4.95	5.3	0.865	8
	7	Yes	9.31	372.43	10.56	4.5	0.549	4	9.99	469.75	6.77	4.3	0.664	6
	8	No	7.20	267.46	8.50	5.7	0.534	4	8.18	353.59	8.56	4.7	0.630	6
	9	No	7.70	303.87	9.71	5.2	0.536	4	8.56	381.59	11.72	4.2	0.625	6
Firebird	1	No												
	2	No	3.74	200.29	2.27	8.0	0.532	4	14.73	428.23	1.38	6.5	0.762	6
	3	No	17.10	207.63	1.45	8.8	0.684	5	13.17	528.26	3.41	5.0	0.539	5
	4	Yes	16.38	509.15	1.84	5.4	0.579	4	34.45	470.74	2.34	5.8	0.727	6
	5	Yes	12.25	193.74	1.35	9.2	0.618	4	17.57	280.23	0.50	8.2	0.621	4
	6	Yes	2.93	333.78	2.21	6.1	0.445	3	10.76	500.54	2.87	5.1	0.412	3
Saab	1	No	0.49	27.91	3.49	7.8	0.509	4	0.38	11.82	4.13	7.4	0.512	5
	2	No	0.30	32.22	6.91	6.0	0.524	4	0.67	23.39	4.53	8.8	0.633	6
	3	No	0.17	30.60	7.67	6.6	0.501	4	0.70	12.77	5.51	7.7	0.533	5
	4	Yes	0.30	5.67	2.39	11.6	0.868	5	0.46	5.78	2.73	9.9	0.750	5
	5	Yes	0.51	28.01	5.57	6.0	0.510	4	0.52	6.64	3.77	6.8	0.556	5
Volvo	1	No	0.65	7.86	3.19	7.1	0.537	4	0.45	4.47	2.70	9.3	0.651	5
	2	No	0.39	2.60	2.79	9.6	0.581	4	0.34	2.43	1.87	10.7	0.681	5
	3	No	0.32	3.21	1.33	9.9	0.653	4	0.32	1.63	2.05	10.2	0.642	5
	4	No	0.51	3.45	3.02	8.2	0.526	4	0.43	4.80	2.14	10.1	0.644	5
	5	Yes	0.52	5.23	2.85	8.5	0.615	4	0.39	3.53	1.73	10.6	0.771	5
	6	Yes	0.51	5.24	2.15	8.2	0.636	4	0.38	2.68	1.66	10.7	0.781	5

Table A5 (Continued)

Measured Test Results -- Accelerations from 30 to 60 MPH (Continued)

			******** 30 - 60 at 5 mph/sec ************						******** 30 - 60 at 6 mph/sec ************					
			--EMISSIONS (g/mi)--						--EMISSIONS (g/mi)--					
VEHICLE	TEST #	DYNO CLPD ?	HC	CO	NOx	F.E. (mpg)	TOTAL DIST. (mi)	ACCELS PER TEST	HC	CO	NOx	F.E. (mpg)	TOTAL DIST. (mi)	ACCELS PER TEST
Pinto	1	Yes	0.79	37.10	1.40	10.9	0.908	7						
	2	Yes												
	3	Yes												
	4	Yes												
	5	Yes												
	6	No												
	7	No												
Impala	1	Yes	8.28	0.0	5.00	13.9	0.845	8						
	2	Yes	8.69	0.24	5.67	11.1	0.794	7						
	3	Yes												
	4	Yes	8.88	0.0	5.78	12.3	0.845	8						
	5	Yes	10.09	431.57	6.6	4.5	0.716	7	7.76	342.02	6.86	5.3	0.820	8
	6	Yes	11.02	528.86	9.01	3.6	0.570	6	9.71	440.32	7.42	4.3	0.764	8
	7	Yes	10.34	501.58	8.38	4.0	0.682	7	11.03	553.46	9.85	3.5	0.566	6
	8	No	9.86	444.00	8.10	4.3	0.617	7	8.59	422.92	7.41	4.6	0.700	8
	9	No	11.25	553.67	8.91	3.6	0.639	7	3.08	495.85	8.82	4.0	0.695	8
Firebird	1	No												
	2	No												
	3	No												
	4	Yes												
	5	Yes												
	6	Yes												
Saab	1	No	1.50	4.38	2.24	8.8	0.599	6	1.81	2.65	1.10	11.8	0.733	7
	2	No	0.69	4.00	1.35	13.1	0.800	8						
	3	No	1.15	6.71	2.53	8.7	0.555	5						
	4	Yes	1.01	5.71	2.21	11.7	0.864	6						
	5	Yes	1.40	3.73	2.42	10.0	0.688	6						
Volvo	1	No												
	2	No												
	3	No												
	4	No												
	5	Yes												
	6	Yes												

Appendix B

Fuel Consumed and Total Emissions during Acceleration Cycles
(Calculated from data in Appendix A)

Table B1

Calculated Test Results -- Wide Open Throttle Accelerations

			********** 0 - 30 @ WOT ***********					********** 0 - 60 @ WOT ***********				
			-- Total Emissions --					-- Total Emissions --				
VEHICLE	TEST #	Dyno Clpd ?	HC (g)	CO (g)	NOx (g)	Fuel Used (gal.)	Total Dist. (mile)	HC (g)	CO (g)	NOx (g)	Fuel Used (gal.)	Total Dist. (mile)
Pinto	1	Yes	0.025	2.352	0.067	0.0043	0.020	0.205	6.241	0.328	0.0172	0.143
	2	Yes	0.026	2.617	0.097	0.0061	0.028	0.315	10.472	0.427	0.0266	0.213
	3	Yes	0.049	3.397	0.109	0.0062	0.027	0.238	9.581	0.493	0.0256	0.218
	4	Yes	0.027	2.158	0.141	0.0040	0.027	0.223	10.273	0.583	0.0158	0.189
	5	Yes	0.039	3.485	0.109	0.0064	0.025	0.240	9.854	0.554	0.0257	0.198
	6	No	0.024	1.593	0.032	0.0025	0.009	0.232	10.422	0.525	0.0271	0.246
	7	No	0.018	1.458	0.021	0.0023	0.011	0.188	10.474	0.479	0.0254	0.224
Impala	1	Yes	0.511	0.382	0.151	0.0057	0.019	1.599	0.088	0.909	0.0168	0.119
	2	Yes	0.541	0.495	0.167	0.0058	0.019	1.528	0.149	0.905	0.0167	0.120
	3	Yes	0.442	0.448	0.139	0.0052	0.018	1.368	0.318	0.851	0.0160	0.110
Firebird	1	No										
	2	No	4.057	24.227	0.016	0.0115	0.030	8.494	87.878	0.228	0.0397	0.147
	3	No	3.882	18.719	0.023	0.0110	0.030	7.871	92.858	0.246	0.0399	0.152
	4	Yes	3.352	22.052	0.015	0.0102	0.032	7.112	93.276	0.119	0.0383	0.180
	5	Yes	3.360	23.022	0.016	0.0097	0.032	10.347	95.439	0.176	0.0428	0.171
	6	Yes	3.686	24.438	0.016	0.0105	0.033	7.633	84.802	0.221	0.0367	0.165
Rabbit	1	Yes	0.132	0.424	0.144	0.0040	0.038	1.315	2.787	0.625	0.0187	0.250
	2	Yes	0.265	0.355	0.122	0.0036	0.035	1.623	2.688	0.538	0.0183	0.258
	3	Yes	0.250	0.374	0.126	0.0036	0.034	1.567	2.593	0.563	0.0177	0.246
	4	No	0.171	0.344	0.141	0.0034	0.039	1.494	2.423	0.539	0.0166	0.258
	5	No	0.256	0.351	0.116	0.0032	0.032	1.602	2.775	0.546	0.0181	0.248
Saab	1	No	0.007	2.571	0.034	0.0036	0.018	0.119	3.170	0.399	0.0180	0.130
	2	No	0.004	3.137	0.058	0.0041	0.020	0.186	3.857	0.495	0.0189	0.150
	3	No	0.007	2.454	0.143	0.0057	0.019	0.184	1.273	0.454	0.0196	0.128
	4	Yes	0.820	2.891	0.085	0.0053	0.021	2.374	1.368	0.495	0.0248	0.159
	5	Yes	0.029	3.024	0.123	0.0053	0.021	0.127	5.296	0.151	0.0090	0.126
Volvo	1	No	0.040	0.131	0.092	0.0040	0.021	0.034	2.357	0.798	0.0208	0.142
	2	No	0.017	0.125	0.088	0.0052	0.027	0.119	1.629	0.692	0.0212	0.153
	3	No	0.015	0.087	0.101	0.0050	0.029	0.075	0.733	0.446	0.0212	0.152
	4	No	0.014	0.125	0.076	0.0045	0.025	0.129	1.866	0.738	0.0208	0.144
	5	Yes	0.024	0.189	0.125	0.0063	0.025	0.164	2.007	0.790	0.0271	0.165
	6	Yes	0.021	0.133	0.113	0.0054	0.025	0.121	1.420	0.794	0.0256	0.169

Table B2

Calculated Test Results -- Accelerations from 0 to 30 MPH

			******** 0 - 30 @ 3 mph/sec -- Total Emissions --				*******	******** 0 - 30 @ 4 mph/sec -- Total Emissions --				*******
VEHICLE	TEST #	Dyno Clpd ?	HC (g)	CO (g)	NOx (g)	Fuel Used (gal.)	Total Dist. (mile)	HC (g)	CO (g)	NOx (g)	Fuel Used (gal.)	Total Dist. (mile)
Pinto	1	Yes	0.011	0.180	0.109	0.0054	0.051	0.026	0.273	0.095	0.0046	0.039
	2	Yes	0.028	0.448	0.133	0.0068	0.054	0.040	1.053	0.296	0.0102	0.039
	3	Yes	0.014	0.223	0.158	0.0077	0.049	0.031	0.586	0.181	0.0071	0.042
	4	Yes	0.035	0.287	0.199	0.0055	0.051	0.033	0.981	0.222	0.0048	0.037
	5	Yes	0.095	1.966	0.217	0.0088	0.049	0.045	1.464	0.215	0.0075	0.038
	6	No	0.096	1.134	0.183	0.0073	0.048	0.074	1.566	0.168	0.0063	0.037
	7	No	0.061	0.885	0.193	0.0080	0.046	0.031	1.646	0.182	0.0077	0.032
Impala	1	Yes	0.405	2.876	1.035	0.0075	0.043	0.593	3.767	1.476	0.0106	0.038
	2	Yes	1.326	3.689	1.225	0.0109	0.047	0.377	3.156	1.019	0.0078	0.037
	3	Yes	0.455	3.893	1.334	0.0098	0.047	0.370	2.725	1.280	0.0085	0.040
	4	Yes	0.493	3.855	1.287	0.0095	0.047	0.382	3.782	1.005	0.0082	0.034
	5	Yes	0.494	4.029	1.111	0.0097	0.048	0.388	2.209	1.173	0.0091	0.034
	6	Yes	0.607	8.706	1.381	0.0133	0.045	0.468	6.489	1.184	0.0114	0.033
	7	Yes	0.507	5.772	1.273	0.0108	0.045	0.423	7.216	1.027	0.0098	0.033
	8	No	0.510	4.365	1.334	0.0101	0.046	0.373	2.809	1.250	0.0087	0.033
	9	No	0.476	4.031	1.428	0.0105	0.045	0.360	2.229	1.215	0.0088	0.033
Firebird	1	No										
	2	No	0.054	6.796	0.110	0.0069	0.047	0.032	1.568	0.201	0.0060	0.031
	3	No	0.030	0.126	0.112	0.0061	0.045	0.022	0.463	0.210	0.0059	0.028
	4	Yes	0.363	1.770	0.260	0.0076	0.046	1.553	11.329	0.240	0.0101	0.034
	5	Yes	0.014	0.240	0.114	0.0059	0.050	0.015	1.212	0.224	0.0060	0.032
	6	Yes	0.021	0.183	0.169	0.0071	0.045	0.012	1.365	0.336	0.0075	0.036
Rabbit	1	Yes	0.700	1.895	0.638	0.0164	0.088	0.520	0.836	0.210	0.0063	0.039
	2	Yes	0.470	0.580	0.215	0.0053	0.046	0.413	0.562	0.167	0.0046	0.038
	3	Yes	0.472	0.626	0.229	0.0051	0.047	0.131	0.548	0.180	0.0043	0.040
	4	No	0.286	0.581	0.211	0.0047	0.043	0.216	0.513	0.146	0.0041	0.037
	5	No	0.276	0.649	0.226	0.0053	0.045	0.272	0.839	0.199	0.0064	0.036
Saab	1	No	0.013	0.588	0.276	0.0063	0.043	0.027	4.187	0.219	0.0069	0.032
	2	No	0.025	4.738	0.388	0.0071	0.042	0.024	3.890	0.488	0.0047	0.029
	3	No	0.034	0.937	0.430	0.0078	0.044	0.015	2.969	0.499	0.0072	0.031
	4	Yes	0.013	0.626	0.374	0.0085	0.041	0.050	1.079	0.324	0.0087	0.034
	5	Yes	0.014	0.925	0.219	0.0088	0.043	0.045	0.693	0.266	0.0086	0.033
Volvo	1	No	0.045	1.218	0.360	0.0076	0.043	0.044	1.309	0.441	0.0085	0.034
	2	No	0.058	2.043	0.418	0.0079	0.046	0.043	1.253	0.358	0.0080	0.034
	3	No	0.048	1.748	0.385	0.0078	0.044	0.049	1.448	0.428	0.0078	0.035
	4	No	0.032	0.913	0.268	0.0078	0.045	0.032	0.655	0.265	0.0085	0.034
	5	Yes	0.047	1.130	0.381	0.0090	0.047	0.051	0.943	0.332	0.0098	0.037
	6	Yes	0.026	0.171	0.234	0.0089	0.046	0.058	0.887	0.164	0.0098	0.035

Table B2 (Continued)

Calculated Test Results -- Accelerations from 0 to 30 MPH (Continued)

			******** 0 - 30 @ 5 mph/sec -- Total Emissions --			*******		******** 0 - 30 @ 6 mph/sec -- Total Emissions --			*******	
VEHICLE	TEST #	Dyno Clpd ?	HC (g)	CO (g)	NOx (g)	Fuel Used (gal.)	Total Dist. (mile)	HC (g)	CO (g)	NOx (g)	Fuel Used (gal.)	Total Dist. (mile)
Pinto	1	Yes	0.018	0.258	0.090	0.0041	0.033					
	2	Yes	0.027	1.565	0.134	0.0061	0.028					
	3	Yes	0.039	2.329	0.158	0.0073	0.030					
	4	Yes	0.055	2.774	0.264	0.0056	0.029	0.053	2.704	0.175	0.0044	0.027
	5	Yes	0.050	2.251	0.249	0.0081	0.029					
	6	No	0.033	1.315	0.156	0.0060	0.026	0.032	1.652	0.117	0.0052	0.034
	7	No	0.056	3.568	0.197	0.0091	0.028	0.082	3.357	0.146	0.0069	0.021
Impala	1	Yes	0.522	1.974	1.162	0.0077	0.031					
	2	Yes	0.308	3.063	0.843	0.0071	0.028					
	3	Yes	0.348	2.231	0.826	0.0073	0.028					
	4	Yes	0.318	2.287	0.677	0.0064	0.027					
	5	Yes	0.325	3.892	0.831	0.0077	0.027	0.410	9.167	0.766	0.0098	0.023
	6	Yes	0.624	17.597	1.032	0.0147	0.028	0.434	8.375	0.844	0.0105	0.023
	7	Yes	0.420	8.094	0.990	0.0103	0.027	0.399	10.367	0.734	0.0099	0.023
	8	No	0.345	4.051	1.031	0.0081	0.028	0.324	6.307	0.880	0.0083	0.022
	9	No	0.431	8.407	0.981	0.0109	0.027	0.556	18.256	0.781	0.0136	0.020
Firebird	1	No										
	2	No	0.188	3.691	0.223	0.0068	0.025	0.370	7.264	0.239	0.0066	0.023
	3	No	0.222	4.585	0.338	0.0076	0.024	1.275	11.551	0.131	0.0081	0.023
	4	Yes	3.239	23.201	0.052	0.0119	0.032	3.182	18.442	0.018	0.0096	0.031
	5	Yes	0.052	6.671	0.274	0.0070	0.027	0.238	8.314	0.200	0.0066	0.027
	6	Yes	0.700	12.380	0.402	0.0115	0.030	1.972	20.398	0.249	0.0138	0.032
Rabbit	1	Yes	0.502	0.770	0.213	0.0061	0.038					
	2	Yes	0.120	0.360	0.091	0.0027	0.035					
	3	Yes	0.441	0.616	0.066	0.0046	0.036					
	4	No	0.196	0.533	0.133	0.0040	0.034					
	5	No	0.247	0.878	0.182	0.0060	0.029					
Saab	1	No	0.130	2.366	0.198	0.0081	0.023	0.018	1.549	0.184	0.0068	0.022
	2	No	0.108	3.130	0.269	0.0095	0.023	0.109	2.147	0.284	0.0092	0.025
	3	No	0.043	3.068	0.721	0.0105	0.026	0.082	1.797	0.396	0.0090	0.023
	4	Yes	0.062	2.683	0.334	0.0111	0.028	0.095	2.476	0.321	0.0107	0.027
	5	Yes	0.082	3.015	0.300	0.0110	0.032	0.155	0.907	0.266	0.0100	0.023
Volvo	1	No	0.080	1.824	0.564	0.0092	0.028	0.053	1.334	0.459	0.0079	0.024
	2	No	0.020	0.125	0.266	0.0068	0.032	0.028	0.277	0.264	0.0068	0.032
	3	No	0.031	0.435	0.358	0.0072	0.032	0.027	0.416	0.336	0.0061	0.031
	4	No	0.048	0.776	0.144	0.0087	0.026	0.038	0.406	0.181	0.0083	0.024
	5	Yes	0.032	0.193	0.157	0.0108	0.034	0.047	0.646	0.228	0.0088	0.033
	6	Yes	0.071	1.280	0.330	0.0112	0.031	0.079	1.235	0.326	0.0109	0.032

Table B3

Calculated Test Results -- Accelerations from 30 to 60 MPH

VEHICLE	TEST #	Dyno Clpd ?	******* 30 - 60 @ 3 mph/sec -- Total Emissions -- HC (g)	CO (g)	NOx (g)	Fuel Used (gal.)	******* Total Dist. (mile)	******* 30 - 60 @ 4 mph/sec -- Total Emissions -- HC (g)	CO (g)	NOx (g)	Fuel Used (gal.)	******* Total Dist. (mile)
Pinto	1	Yes	0.041	4.798	0.369	0.0136	0.176	0.057	3.998	0.183	0.0105	0.132
	2	Yes	0.125	6.594	0.250	0.0179	0.198	0.137	4.918	0.238	0.0182	0.207
	3	Yes	0.167	4.798	0.268	0.0165	0.199					
	4	Yes										
	5	Yes	0.216	7.727	0.436	0.0251	0.183	0.164	5.502	0.293	0.0184	0.179
	6	No	0.088	5.995	0.310	0.0150	0.188	0.107	5.049	0.246	0.0140	0.182
	7	No	0.077	5.516	0.253	0.0145	0.178	0.120	4.729	0.235	0.0145	0.177
Impala	1	Yes	0.949	0.971	0.999	0.0139	0.136	0.899	0.192	0.724	0.0101	0.119
	2	Yes	1.045	0.818	1.090	0.0149	0.161	1.023	0.110	0.725	0.0108	0.123
	3	Yes	0.974	0.487	0.867	0.0132	0.142	0.794	1.021	0.495	0.0103	0.119
	4	Yes	1.038	0.564	1.125	0.0144	0.137	1.100	0.0	0.736	0.0103	0.113
	5	Yes	1.165	38.451	1.341	0.0283	0.144	1.123	45.788	0.751	0.0251	0.118
	6	Yes	0.705	28.588	0.983	0.0197	0.136	0.822	37.551	0.535	0.0204	0.108
	7	Yes	1.278	51.116	1.449	0.0305	0.137	1.106	51.986	0.749	0.0257	0.111
	8	No	0.961	35.706	1.135	0.0234	0.133	0.859	37.127	0.899	0.0223	0.105
	9	No	1.032	40.719	1.301	0.0258	0.134	0.892	39.749	1.221	0.0248	0.104
Firebird	1	No										
	2	No	0.497	26.639	0.302	0.0166	0.133	1.871	54.385	0.175	0.0195	0.127
	3	No	2.339	28.404	0.198	0.0155	0.137	1.420	56.946	0.368	0.0216	0.108
	4	Yes	2.371	73.699	0.266	0.0268	0.145	4.174	57.038	0.284	0.0209	0.121
	5	Yes	1.893	29.933	0.209	0.0168	0.154	2.728	43.506	0.078	0.0189	0.155
	6	Yes	0.435	49.511	0.328	0.0243	0.148	1.478	68.741	0.394	0.0269	0.137
Rabbit	1	Yes										
	2	Yes										
	3	Yes										
	4	No										
	5	No										
Saab	1	No	0.062	3.552	0.444	0.0163	0.127	0.039	1.210	0.423	0.0138	0.102
	2	No	0.039	4.221	0.905	0.0218	0.131	0.071	2.468	0.478	0.0120	0.105
	3	No	0.021	3.833	0.961	0.0190	0.125	0.075	1.361	0.587	0.0138	0.107
	4	Yes	0.052	0.984	0.415	0.0150	0.174	0.069	0.867	0.409	0.0152	0.150
	5	Yes	0.065	3.571	0.710	0.0212	0.127	0.058	0.738	0.419	0.0164	0.111
Volvo	1	No	0.087	1.055	0.428	0.0189	0.134	0.059	0.582	0.352	0.0140	0.130
	2	No	0.057	0.378	0.405	0.0151	0.145	0.046	0.331	0.255	0.0127	0.136
	3	No	0.052	0.524	0.217	0.0165	0.163	0.041	0.209	0.263	0.0126	0.128
	4	No	0.067	0.454	0.397	0.0160	0.132	0.055	0.618	0.276	0.0128	0.129
	5	Yes	0.080	0.804	0.438	0.0181	0.154	0.060	0.544	0.267	0.0145	0.154
	6	Yes	0.081	0.833	0.342	0.0194	0.159	0.059	0.419	0.259	0.0146	0.156

Table B3 (Continued)

Calculated Test Results -- Accelerations from 30 to 60 MPH (Continued)

			******* 30 - 60 @ 5 mph/sec ******* -- Total Emissions --					******* 30 - 60 @ 6 mph/sec ******* -- Total Emissions --				
VEHICLE	TEST #	Dyno Clpd ?	HC (g)	CO (g)	NOx (g)	Fuel Used (gal.)	Total Dist. (mile)	HC (g)	CO (g)	NOx (g)	Fuel Used (gal.)	Total Dist. (mile)
Pinto	1	Yes	0.102	4.812	0.182	0.0119	0.130					
	2	Yes										
	3	Yes										
	4	Yes										
	5	Yes										
	6	No										
	7	No										
Impala	1	Yes	0.875	0.0	0.528	0.0076	0.106					
	2	Yes	0.986	0.027	0.643	0.0102	0.113					
	3	Yes										
	4	Yes	0.938	0.0	0.611	0.0086	0.106					
	5	Yes	1.032	44.143	0.675	0.0227	0.102	0.795	35.057	0.703	0.0193	0.102
	6	Yes	1.047	50.242	0.856	0.0264	0.095	0.927	42.051	0.709	0.0222	0.095
	7	Yes	1.007	48.868	0.816	0.0244	0.097	1.040	52.210	0.929	0.0270	0.094
	8	No	0.869	39.135	0.714	0.0205	0.088	0.752	37.005	0.648	0.0190	0.087
	9	No	1.027	50.542	0.813	0.0254	0.091	0.268	43.077	0.766	0.0217	0.087
Firebird	1	No										
	2	No										
	3	No										
	4	Yes										
	5	Yes										
	6	Yes										
Rabbit	1	Yes										
	2	Yes										
	3	Yes										
	4	No										
	5	No										
Saab	1	No	0.150	0.437	0.224	0.0113	0.100	0.190	0.277	0.115	0.0089	0.105
	2	No	0.069	0.400	0.135	0.0076	0.100					
	3	No	0.128	0.745	0.281	0.0128	0.111					
	4	Yes	0.145	0.822	0.318	0.0123	0.144					
	5	Yes	0.161	0.428	0.277	0.0115	0.115					
Volvo	1	No										
	2	No										
	3	No										
	4	No										
	5	Yes										
	6	Yes										

Appendix C

Opacity, Sulfate, and Total Particulate Test Data

Table C1

Opacity (smoke) Test Data
VW Rabbit Diesel

	--------- Dynamometer Rollers ---------						
	****** Coupled ******				** Uncoupled **		
Test Type	Test #3	Test #4	Test #5	Avg	Test #1	Test #2	Avg
0-30 @ 3 mph/sec	28	26	32	29	30	27	29
0-30 @ 4 mph/sec	28	27	35	30	33	30	32
0-30 @ 5 mph/sec	33	31	39	34	33	35	34
0-30 @ WOT	38	33	41	37	35	42	39
0-60 @ WOT	43	41	46	43	44	44	44

Opaque = 100% of scale.

Table C2

Sulfate (SO_4) and Total Particulate (TP)
Exhaust Emissions (mg/mi)

	------- Coupled Rollers ------				----- Uncoupled Rollers -----			
	Clipped FTP		**Unclipped FTP**		***Clipped FTP***		**Unclipped FTP**	
VEHICLE	SO_4	TP	SO_4	TP	SO_4	TP	SO_4	TP
Pinto	14.5	25.5	10.0	19.6	8.8	21.0	3.4	15.6
Impala	8.9	62.0	8.6	68.0	9.1	87.0	8.4	103.0
F.Bird	5.8	13.2	3.9	10.3	2.2	5.6	3.9	8.4
Rabbit	8.7	570.0	9.7	620.0	8.9	600.0	8.1	540.0
Saab	2.3	3.6	2.4	3.0	2.7	5.0	3.3	5.3
Volvo	2.4	3.7	2.3	5.7	-	-	-	-

Table C3

Effect (Δ%†) of Higher Acceleration Rates on FTP Emissions of Sulfate (SO_4) and Total Particulate (TP)

VEHICLE	Uncoupled Δ% SO_4	Uncoupled Δ%TP	Coupled Δ% SO_4	Coupled Δ% TP
Pinto	-61.4%	-25.7%	-31.0%	-23.1%
Impala	-7.7%	18.4%	-3.4%	9.7%
F.Bird	77.3%	50.0%	-32.8%	-22.0%
Rabbit	-9.0%	-10.0%	11.5%	8.8%
Saab	22.2%	6.0%	4.3%	-16.7%
Volvo	-	-	-4.2%	54.1%

Table C4

Effect (Δ%‡) of Coupling Dynamometer Rollers on FTP Emissions of Sulfate (SO_4) and Total Particulate (TP)

VEHICLE	Clipped FTP Δ% SO_4	Clipped FTP Δ%TP	Unclipped FTP Δ% SO_4	Unclipped FTP % TP
Pinto	64.8%	21.4%	194.1%	25.6%
Impala	-2.2%	-28.7%	2.4%	-34.0%
F.Bird	163.4%	135.7%	0.0%	22.6%
Rabbit	-2.2%	-5.0%	19.8%	14.8%
Saab	-14.8%	-28.0%	-27.3%	-43.4%

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† $\Delta\% = \frac{\text{Unclipped - Clipped}}{\text{Clipped}} \times 100$

‡ $\Delta\% = \frac{\text{Coupled - Uncoupled}}{\text{Uncoupled}} \times 100$

Appendix D

Statistical Analyses of Emissions and Fuel Economy data (from Appendices A and B)

Tables D1 through D6 are based on the FTP data in Tables A1 and A2 of Appendix A.

Tables D7 through D18 are based on the emissions data in Tables B1 through B3 of Appendix B.

Tables D19 through D30 are based on the fuel economy and grams per mile emissions data in Tables A3 through A5 of Appendix A.

Table D1

FTP Cycles

Ford Pinto

'Clipped' FTP Cycle, without Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	.346	.365	.35550	.013435	3.77
CO (grams/mi)	2	4.79	5.32	5.0550	.37477	7.41
NOx (grams/mi)	2	.69	.71	.70000	.014142	2.02
Fuel Economy (mpg)	2	13.0	14.2	13.600	.84853	6.24

'Clipped' FTP Cycle, with Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	5	.389	.425	.40475	.015370	3.80
CO (grams/mi)	5	5.99	6.93	6.4625	.41548	6.43
NOx (grams/mi)	5	.69	.76	.73000	.031623	4.33
Fuel Economy (mpg)	5	16.7	17.3	17.100	.28284	1.65

'Unclipped' FTP Cycle, without Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	.328	.337	.33250	.00636	1.91
CO (grams/mi)	2	5.20	5.23	5.2150	.02121	0.41
NOx (grams/mi)	2	.68	.69	.68500	.00707	1.03
Fuel Economy (mpg)	2	13.0	13.1	13.050	.070711	0.54

'Unclipped' FTP Cycle, with Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	.404	.470	.43700	.046669	10.68
CO (grams/mi)	2	6.85	7.15	7.0000	.21213	3.03
NOx (grams/mi)	2	.72	.73	.72500	.00707	0.98
Fuel Economy (mpg)	2	16.7	16.9	16.800	.14142	0.84

Table D2

FTP Cycles

Chevrolet Impala

'Clipped' FTP Cycle, without Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	4.376	4.619	4.4975	.17183	3.82
CO (grams/mi)	2	35.90	39.32	37.610	2.4183	6.43
NOx (grams/mi)	2	5.10	6.60	5.8500	1.06066	18.13
Fuel Economy (mpg)	2	14.3	14.5	14.400	.14142	0.98

'Clipped' FTP Cycle, with Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	6	4.293	4.905	4.6803	.22684	4.85
CO (grams/mi)	6	42.79	49.48	44.458	2.54063	5.71
NOx (grams/mi)	6	4.42	4.93	4.7517	.185733	3.91
Fuel Economy (mpg)	6	13.3	14.5	14.067	.42740	3.04

'Unclipped' FTP Cycle, without Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	4.411	4.971	4.6910	.39598	8.44
CO (grams/mi)	2	34.11	35.68	34.895	1.1102	3.18
NOx (grams/mi)	2	4.60	5.28	4.9400	.48083	9.73
Fuel Economy (mpg)	2	14.3	14.6	14.450	.21213	1.47

'Unclipped' FTP Cycle, with Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	4.042	4.951	4.5963	.48628	10.58
CO (grams/mi)	3	42.60	45.73	44.537	1.6922	3.80
NOx (grams/mi)	3	4.59	4.95	4.7933	.18448	3.85
Fuel Economy (mpg)	3	13.9	14.3	14.067	.20817	1.48

Table D3

FTP Cycles

Pontiac Firebird

'Clipped' FTP Cycle, without Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	4	.253	.357	.29400	.044796	15.24
CO (grams/mi)	4	3.56	4.23	3.8425	.32428	8.44
NOx (grams/mi)	4	.51	.63	.57000	.058878	10.33
Fuel Economy (mpg)	4	10.7	11.1	10.850	.17321	1.60

'Clipped' FTP Cycle, with Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	.766	.790	.77800	.016971	2.18
CO (grams/mi)	2	7.44	8.16	7.8000	.50911	6.53
NOx (grams/mi)	2	.59	.60	.59500	.0070711	1.19
Fuel Economy (mpg)	2	12.9	13.1	13.000	.14142	1.09

'Unclipped' FTP Cycle, without Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	.270	.283	.27650	.0091921	3.32
CO (grams/mi)	2	3.78	4.16	3.9700	.26870	6.77
NOx (grams/mi)	2	.52	.55	.53500	.021313	3.97
Fuel Economy (mpg)	2	10.9	11.0	10.950	.070711	0.65

'Unclipped' FTP Cycle, with Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	.408	.447	.42750	.027577	6.45
CO (grams/mi)	2	5.81	6.96	6.3850	.81317	12.74
NOx (grams/mi)	2	.64	.64	.64000	.00000	0.0
Fuel Economy (mpg)	2	13.0	13.4	13.200	.28284	2.14

Table D4

FTP Cycles

VW Diesel Rabbit

'Clipped' FTP Cycle, without Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	.611	.643	.62700	.022627	3.61
CO (grams/mi)	2	1.69	1.69	1.6900	.00000	0.0
NOx (grams/mi)	2	1.50	1.52	1.5100	.0141421	0.94
Fuel Economy (mpg)	2	36.3	37.7	37.000	.98995	2.68

'Clipped' FTP Cycle, with Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	.379	.697	.51833	.16261	31.37
CO (grams/mi)	3	1.39	1.56	1.4733	.085049	5.77
NOx (grams/mi)	3	1.46	1.53	1,4950	.049497	3.31
Fuel Economy (mpg)	3	35.8	37.3	36.550	1.0607	2.90

'Unclipped' FTP Cycle, without Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	.665	.797	.73100	.09334	12.77
CO (grams/mi)	2	1.40	1.92	1.6600	.36770	22.15
NOx (grams/mi)	2	1.58	1.61	1.5950	.021213	1.33
Fuel Economy (mpg)	2	35.6	38.4	37.000	1.9799	5.35

'Unclipped' FTP Cycle, with Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	.506	.717	.61150	.14920	24.40
CO (grams/mi)	2	1.40	1.71	1.5550	.21920	14.10
NOx (grams/mi)	2	1.43	1.56	1.4950	.091924	6.15
Fuel Economy (mpg)	2	36.8	36.0	37.400	.84853	2.27

Table D5

FTP Cycles

Saab 900 Turbo

'Clipped' FTP Cycle, without Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	.277	.340	.30850	.044548	14.44
CO (grams/mi)	2	2.44	2.73	2.5850	.20506	7.93
NOx (grams/mi)	2	.89	1.02	.95500	.091924	9.63
Fuel Economy (mpg)	2	18.3	18.6	18.450	.21213	1.15

'Clipped' FTP Cycle, with Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	.328	.403	.36550	.053033	14.51
CO (grams/mi)	2	3.11	3.29	3.2000	.12728	3.98
NOx (grams/mi)	2	1.08	1.12	1.1000	.028284	2.57
Fuel Economy (mpg)	2	18.8	18.8	18.800	.00000	0.0

'Unclipped' FTP Cycle, without Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	.241	.293	.26700	.036770	13.77
CO (grams/mi)	2	2.24	2.54	2.3900	.21213	8.88
NOx (grams/mi)	2	.95	1.00	.97500	.035355	3.63
Fuel Economy (mpg)	2	17.9	18.5	18.200	.42426	2.33

'Unclipped' FTP Cycle, with Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	.285	.301	.29300	.011314	3.86
CO (grams/mi)	2	2.74	3.08	2.9100	.24042	8.26
NOx (grams/mi)	2	.85	.96	.90500	.077782	8.59
Fuel Economy (mpg)	2	18.1	19.0	18.550	.63640	3.43

Table D6

FTP Cycles

Volvo GL

'Clipped' FTP Cycle, without Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	.157	.179	.16800	.015556	9.26
CO (grams/mi)	2	2.25	2.46	2.3550	.14849	6.30
NOx (grams/mi)	2	.70	.71	.70500	.0070711	1.00
Fuel Economy (mpg)	2	19.3	19.7	19.500	.28284	1.45

'Clipped' FTP Cycle, with Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	.196	.268	.23200	.050912	21.94
CO (grams/mi)	2	2.91	3.63	3.2700	.50912	15.57
NOx (grams/mi)	2	.83	.92	.87500	.063640	7.27
Fuel Economy (mpg)	2	18.6	19.0	18.800	.28284	1.50

'Unclipped' FTP Cycle, without Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	.181	.195	.18800	.009899	5.27
CO (grams/mi)	2	2.25	2.79	2.5200	.38184	15.15
NOx (grams/mi)	2	.73	.89	.81000	.11314	13.97
Fuel Economy (mpg)	2	18.9	19.0	18.950	.070711	0.37

'Unclipped' FTP Cycle, with Dynamometer Roll Coupler Installed

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	.201	.208	.20450	.0049501	2.42
CO (grams/mi)	2	3.00	3.14	3.0700	.098995	3.22
NOx (grams/mi)	2	.85	.86	.85500	.0070711	0.83
Fuel Economy (mpg)	2	17.4	19.1	18.250	1.2021	6.59

Table D7

Acceleration Cycles, without Dynamomter Roll Coupler

Ford Pinto

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.018092	.023692	.020892	.0039598	18.9537
Total CO (grams)	2	1.4576	1.5930	1.5253	.095721	6.2756
Total NOx (grams)	2	.021000	.031963	.026482	.0077521	29.2731
Fuel Used (gal)	2	.0023411	.0025339	.0024375	.00013633	5.5930
Dist per Run (mi)	2	.0086154	.010769	.0096923	.0015230	15.7135

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.18788	.23171	.20979	.030992	14.7729
Total CO (grams)	2	10.422	10.474	10.448	.036975	0.3539
Total NOx (grams)	2	.47865	.52504	.50185	.032809	6.5376
Fuel Used (gal)	2	.025417	.027088	.026252	.0011817	4.5014
Dist per Run (mi)	2	.22367	.24650	.23508	.016146	6.8683

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.060914	.096480	.078697	.025149	31.9568
Total CO (grams)	2	.88486	1.1338	1.0093	.17600	17.4378
Total NOx (grams)	2	.18288	.19328	.18808	.0073511	3.9085
Fuel Used (gal)	2	.0072727	.0080351	.0076539	.00053907	7.0431
Dist per Run (mi)	2	.045800	.048000	.046900	.0015556	3.3168

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.030875	.073547	.052211	.030173	57.7905
Total CO (grams)	2	1.5661	1.6458	1.6060	.056333	3.5077
Total NOx (grams)	2	.16800	.18167	.17484	.0096697	5.5306
Fuel Used (gal)	2	.0063277	.0077381	.0070329	.00099731	14.1806
Dist per Run (mi)	2	.032500	.037333	.034917	.0034177	9.7881

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.032760	.056052	.044406	.016470	37.0896
Total CO (grams)	2	1.3151	3.5682	2.4416	1.5932	65.2523
Total NOx (grams)	2	.15574	.19745	.17659	.029492	16.7008
Fuel Used (gal)	2	.0060465	.0090860	.0075663	.0021493	28.4062
Dist per Run (mi)	2	.026000	.028167	.027083	.0015321	5.6571

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.032495	.082376	.057435	.035271	61.4103
Total CO (grams)	2	1.6515	3.3572	2.5044	1.2061	48.1592
Total NOx (grams)	2	.11691	.14559	.13125	.020279	15.4507
Fuel Used (gal)	2	.0051538	.0068664	.0060101	.0012109	20.1477
Dist per Run (mi)	2	.021286	.033500	.027393	.0086368	31.5292

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.076755	.088242	.082499	.0081229	9.8461
Total CO (grams)	2	5.5156	5.9949	5.7553	.33885	5.8876
Total NOx (grams)	2	.25347	.30979	.28163	.039822	14.1398
Fuel Used (gal)	2	.014512	.015020	.014766	.00035907	2.4317
Dist per Run (mi)	2	.17850	.18775	.18312	.0065407	3.5718

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.10738	.12022	.11380	.0090821	7.9808
Total CO (grams)	2	4.7294	5.0487	4.8890	.22577	4.6179
Total NOx (grams)	2	.23514	.24570	.24042	.0074642	3.1047
Fuel Used (gal)	2	.014000	.014492	.014246	.00034776	2.4411
Dist per Run (mi)	2	.17680	.18200	.17940	.0036770	2.0496

Table D8

Acceleration Cycles, with Dynamomter Roll Coupler Installed

Ford Pinto

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	5	.025010	.049050	.033365	.010377	31.1014
Total CO (grams)	5	2.1582	3.4848	2.8020	.60650	21.6452
Total NOx (grams)	5	.067240	.14111	.10469	.026605	25.4131
Fuel Used (gal)	5	.0040341	.0064423	.0054103	.0011577	21.3981
Dist per Run (mi)	5	.020500	.027500	.025400	.0028904	11.3795

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	5	.20473	.31475	.24402	.041927	17.1818
Total CO (grams)	5	6.2406	10.472	9.2842	1.7367	18.7060
Total NOx (grams)	5	.32785	.58315	.47711	.10272	21.5296
Fuel Used (gal)	5	.015778	.026583	.022194	.0052250	23.5424
Dist per Run (mi)	5	.14317	.21800	.19223	.029710	15.4554

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	5	.011293	.094575	.036596	.033911	92.6631
Total CO (grams)	5	.18018	1.9657	.62083	.75863	122.1961
Total NOx (grams)	5	.10934	.21728	.16338	.044834	27.4415
Fuel Used (gal)	5	.0054035	.0088182	.0068324	.0014646	21.4361
Dist per Run (mi)	5	.048500	.053600	.050807	.0020208	3.9774

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	5	.025822	.045220	.035063	.0077173	22.0098
Total CO (grams)	5	.27270	1.4638	.87126	.45713	52.4677
Total NOx (grams)	5	.095074	.29609	.20179	.072998	36.1752
Fuel Used (gal)	5	.0046029	.010226	.0068363	.0022993	33.6337
Dist per Run (mi)	5	.036833	.042000	.038963	.0019186	4.9242

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	5	.017712	.055326	.037745	.015719	41.6452
Total CO (grams)	5	.25846	2.7736	1.8354	.98188	53.4968
Total NOx (grams)	5	.089872	.26397	.17912	.075034	41.8903
Fuel Used (gal)	5	.0041000	.0081349	.0062275	.0015582	25.0213
Dist per Run (mi)	5	.028000	.032800	.029858	.0017766	5.9502

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	1	.052894	.052894	.052894	N/A	N/A
Total CO (grams)	1	2.7041	2.7041	2.7041	N/A	N/A
Total NOx (grams)	1	.17523	.17523	.17523	N/A	N/A
Fuel Used (gal)	1	.0044467	.0044467	.0044467	N/A	N/A
Dist per Run (mi)	1	.027125	.027125	.027125	N/A	N/A

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	4	.040572	.21633	.13720	.074440	54.2566
Total CO (grams)	4	4.7981	7.7275	5.9795	1.4404	24.0890
Total NOx (grams)	4	.25011	.43633	.33081	.087584	26.4756
Fuel Used (gal)	4	.013569	.025114	.018279	.0049006	26.8100
Dist per Run (mi)	4	.17640	.19860	.18921	.011152	5.8940

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.056921	.16445	.11939	.055836	46.7677
Total CO (grams)	3	3.9977	5.5019	4.8059	.75834	15.7794
Total NOx (grams)	3	.18268	.29315	.23805	.055237	23.2039
Fuel Used (gal)	3	.010506	.018428	.015705	.0045038	28.6775
Dist per Run (mi)	3	.13237	.20725	.17279	.037791	21.8710

Table D8 (Continued)

Acceleration Cycles, with Dynamomter Roll Coupler Installed (Continued)

Ford Pinto

Acceleration from 30 to 60 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	1	.10247	.10247	.10247	N/A	N/A
Total CO (grams)	1	4.8124	4.8124	4.8124	N/A	N/A
Total NOx (grams)	1	.18160	.18160	.18160	N/A	N/A
Fuel Used (gal)	1	.011900	.011900	.011900	N/A	N/A
Dist per Run (mi)	1	.12971	.12971	.12971	N/A	N/A

Table D9

Acceleration Cycles, without Dynamomter Roll Coupler

Chevrolet Impala

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.47603	.50964	.49283	.023766	4.8224
Total CO (grams)	2	4.0313	4.3650	4.1981	.23591	5.6194
Total NOx (grams)	2	1.3341	1.4281	1.3811	.066472	4.8130
Fuel Used (gal)	2	.010109	.010523	.010316	.00029314	2.8416
Dist per Run (mi)	2	.045250	.046500	.045875	.00088388	1.9267

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.36000	.37323	.36661	.0093550	2.5518
Total CO (grams)	2	2.2293	2.8086	2.5190	.40962	16.2612
Total NOx (grams)	2	1.2153	1.2497	1.2325	.024308	1.9723
Fuel Used (gal)	2	.0086842	.0087719	.0087281	.000062027	0.7107
Dist per Run (mi)	2	.033000	.033333	.033167	.00023570	0.7106

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.34484	.43103	.38793	.060946	15.7106
Total CO (grams)	2	4.0514	8.4072	6.2293	3.0801	49.4453
Total NOx (grams)	2	.98149	1.0311	1.0063	.035086	3.4866
Fuel Used (gal)	2	.0081224	.010857	.0094898	.0019337	20.3766
Dist per Run (mi)	2	.027143	.028429	.027786	.00090914	3.2719

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.32377	.55644	.44010	.16453	37.3846
Total CO (grams)	2	6.3073	18.256	12.282	8.4489	68.7909
Total NOx (grams)	2	.78077	.87956	.83017	.069856	8.4147
Fuel Used (gal)	2	.0082870	.013583	.010935	.0037450	34.2478
Dist per Run (mi)	2	.020375	.022375	.021375	.0014142	6.6161

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.96120	1.0318	.99650	.049922	5.0097
Total CO (grams)	2	35.706	40.719	38.212	3.5445	9.2759
Total NOx (grams)	2	1.1347	1.3011	1.2179	.11766	9.6609
Fuel Used (gal)	2	.023421	.025769	.024595	.0016604	6.7510
Dist per Run (mi)	2	.13350	.13400	.13375	.00035355	0.2643

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.85890	.89167	.87528	.023170	2.6472
Total CO (grams)	2	37.127	39.749	38.438	1.8540	4.8234
Total NOx (grams)	2	.89880	1.2208	1.0598	.22771	21.4861
Fuel Used (gal)	2	.022340	.024802	.023571	.0017403	7.3832
Dist per Run (mi)	2	.10417	.10500	.10458	.00058926	0.5635

Acceleration from 30 to 60 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.86909	1.0270	.94803	.11163	11.7749
Total CO (grams)	2	39.135	50.542	44.839	8.0658	17.9883
Total NOx (grams)	2	.71396	.81336	.76366	.070285	9.2037
Fuel Used (gal)	2	.020498	.025357	.022928	.0034357	14.9847
Dist per Run (mi)	2	.088143	.091286	.089714	.0022223	2.4771

Acceleration from 30 to 60 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.26757	.75162	.50960	.34228	67.1664
Total CO (grams)	2	37.005	43.077	40.041	4.2932	10.7220
Total NOx (grams)	2	.64837	.76624	.70731	.083341	11.7828
Fuel Used (gal)	2	.019022	.021719	.020370	.0019071	9.3623
Dist per Run (mi)	2	.086875	.087500	.087187	.00044194	0.5069

Table D10

Acceleration Cycles, with Dynamomter Roll Coupler Installed

Chevrolet Impala

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.44161	.54106	.49798	.051036	10.2486
Total CO (grams)	3	.38192	.49536	.44170	.056967	12.8972
Total NOx (grams)	3	.13677	.16685	.15205	.014101	9.2739
Fuel Used (gal)	3	.0052059	.0058182	.0055619	.00031812	5.7196
Dist per Run (mi)	3	.017700	.019250	.018717	.00088081	4.7059

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	1.3679	1.5992	1.4983	.11848	7.9076
Total CO (grams)	3	.088183	.31795	.18514	.11901	64.2811
Total NOx (grams)	3	.85118	.90924	.88861	.032470	3.6540
Fuel Used (gal)	3	.016000	.016784	.016502	.00043592	2.6416
Dist per Run (mi)	3	.11040	.12040	.11666	.0054525	4.6738

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	7	.40549	1.3258	.61248	.32040	52.3119
Total CO (grams)	7	2.8758	8.7061	4.6886	1.9733	42.0872
Total NOx (grams)	7	1.0346	1.3815	1.2352	.12315	9.9700
Fuel Used (gal)	7	.0075439	.013309	.010218	.0017467	17.0943
Dist per Run (mi)	7	.043000	.047600	.045931	.0015797	3.4393

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	7	.37000	.59273	.42875	.079979	18.6540
Total CO (grams)	7	2.2086	7.2157	4.1920	1.9117	45.6035
Total NOx (grams)	7	1.0048	1.4759	1.1663	.17148	14.7029
Fuel Used (gal)	7	.0077976	.011437	.0093477	.0013287	14.2142
Dist per Run (mi)	7	.033167	.040000	.035619	.0028392	7.9710

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	7	.30778	.62412	.40908	.12145	29.6886
Total CO (grams)	7	1.9740	17.597	5.5911	5.7006	101.9584
Total NOx (grams)	7	.67679	1.1623	.90870	.16179	17.8046
Fuel Used (gal)	7	.0064021	.014737	.0087495	.0029125	33.2876
Dist per Run (mi)	7	.026857	.030667	.027835	.0013432	4.8256

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.39907	.43401	.41445	.017842	4.3050
Total CO (grams)	3	8.3752	10.367	9.3030	1.0028	10.7793
Total NOx (grams)	3	.73436	.84364	.78123	.056274	7.2033
Fuel Used (gal)	3	.0097685	.010455	.010042	.00036346	3.6194
Dist per Run (mi)	3	.022778	.023444	.023074	.00033945	1.4711

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	7	.70534	1.2778	1.0221	.18013	17.6235
Total CO (grams)	7	.48701	51.116	17.285	21.677	125.4093
Total NOx (grams)	7	.86722	1.4494	1.1222	.20641	18.3933
Fuel Used (gal)	7	.013185	.030500	.019282	.0072618	37.6610
Dist per Run (mi)	7	.13617	.16100	.14208	.0089497	6.2991

Acceleration from 30 to 60 mph at 3 mph per sec *(Test numbers 1 to 4 only)*

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	4	.949	1.045	1.002	.047	4.73
Total CO (grams)	4	.487	.971	.710	.224	31.58
Total NOx (grams)	4	.867	1.125	1.020	.115	11.29
Fuel Used (gal)	4	.0132	.0149	.0141	.0007	5.15

Table D10 (Continued)

Acceleration Cycles, with Dynamomter Roll Coupler Installed (Continued)

Chevrolet Impala

Acceleration from 30 to 60 mph at 3 mph per sec *(Test numbers 5 to 7 only)*

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.705	1.278	1.049	.304	28.92
Total CO (grams)	3	28.588	51.116	39.385	11.293	28.67
Total NOx (grams)	3	.983	1.449	1.258	.244	19.39
Fuel Used (gal)	3	.0197	.0305	.0262	.0057	21.81

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	7	.79373	1.1230	.98103	.14071	14.3431
Total CO (grams)	7	0.0	51.986	19.521	24.299	124.4762
Total NOx (grams)	7	.49504	.75060	.67348	.10930	16.2291
Fuel Used (gal)	7	.010056	.025736	.016104	.0073370	45.5601
Dist per Run (mi)	7	.10812	.12329	.11584	.0053222	4.5944

Acceleration from 30 to 60 mph at 4 mph per sec *(Test numbers 1 to 4 only)*

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	4	.794	1.100	.954	.135	14.15
Total CO (grams)	4	.000	1.021	.331	.467	141.15
Total NOx (grams)	4	.495	.736	.670	.117	17.43
Fuel Used (gal)	4	.0101	.0108	.0104	.0003	2.88

Acceleration from 30 to 60 mph at 4 mph per sec *(Test numbers 5 to 7 only)*

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.822	1.123	1.017	.169	16.63
Total CO (grams)	3	37.551	51.986	45.108	7.241	16.05
Total NOx (grams)	3	.535	.751	.678	.124	18.30
Fuel Used (gal)	3	.0204	.0257	.0237	.0029	12.23

Acceleration from 30 to 60 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	6	.87457	1.0469	.98077	.064574	6.5840
Total CO (grams)	6	0.0	50.242	23.880	26.228	109.8324
Total NOx (grams)	6	.52812	.85595	.68821	.12526	18.2008
Fuel Used (gal)	6	.0075989	.026389	.016647	.0087121	52.3344
Dist per Run (mi)	6	.095000	.11343	.10323	.0065995	6.3930

Acceleration from 30 to 60 mph at 5 mph per sec *(Test numbers 1 to 4 only)*

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.875	.986	.933	.056	5.97
Total CO (grams)	3	.000	.027	.009	.016	173.21
Total NOx (grams)	3	.528	.643	.594	.059	9.99
Fuel Used (gal)	3	.0076	.0102	.0088	.0013	14.90

Acceleration from 30 to 60 mph at 5 mph per sec *(Test numbers 5 to 7 only)*

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	1.007	1.047	1.029	.020	1.96
Total CO (grams)	3	44.143	50.242	47.751	3.199	6.70
Total NOx (grams)	3	.675	.856	.782	.095	12.15
Fuel Used (gal)	3	.0227	.0264	.0245	.0019	7.56

Acceleration from 30 to 60 mph at 6 mph per sec *(Only tests 5 to 7 run)*

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.79540	1.0405	.92107	.12267	13.3182
Total CO (grams)	3	35.057	52.210	43.106	8.6249	20.0086
Total NOx (grams)	3	.70315	.92918	.78031	.12895	16.5255
Fuel Used (gal)	3	.019340	.026952	.022834	.0038446	16.8372
Dist per Run (mi)	3	.094333	.10250	.097444	.0044169	4.5328

Table D11

Acceleration Cycles, without Dynamomter Roll Coupler

Pontiac Firebird

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	3.8819	4.0573	3.9696	.12406	3.1253
Total CO (grams)	2	18.719	24.227	21.473	3.8945	18.1367
Total NOx (grams)	2	.015812	.023437	.019624	.0053917	27.4750
Fuel Used (gal)	2	.010988	.011474	.011231	.00034415	3.0643
Dist per Run (mi)	2	.029667	.029833	.029750	.00011785	0.3961

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	7.8715	8.4937	8.1826	.43993	5.3764
Total CO (grams)	2	87.878	92.858	90.368	3.5213	3.8966
Total NOx (grams)	2	.22785	.24570	.23677	.012622	5.3309
Fuel Used (gal)	2	.039730	.039912	.039821	.00012908	0.3242
Dist per Run (mi)	2	.14700	.15167	.14933	.0032998	2.2097

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.029700	.053580	.041640	.016886	40.5523
Total CO (grams)	2	.12645	6.7962	3.4613	4.7162	136.2551
Total NOx (grams)	2	.10951	.11250	.11100	.0021142	1.9047
Fuel Used (gal)	2	.0060811	.0069118	.0064964	.00058738	9.0416
Dist per Run (mi)	2	.045000	.047000	.046000	.0014142	3.0743

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.021580	.031620	.026600	.0070994	26.6895
Total CO (grams)	2	.46259	1.5680	1.0153	.78163	76.9851
Total NOx (grams)	2	.20088	.21027	.20557	.0066374	3.2288
Fuel Used (gal)	2	.0058865	.0059615	.0059240	.000053043	0.8954
Dist per Run (mi)	2	.027667	.031000	.029333	.0023570	8.0353

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.18846	.22209	.20528	.023779	11.5837
Total CO (grams)	2	3.6906	4.5854	4.1380	.63269	15.2898
Total NOx (grams)	2	.22286	.33833	.28060	.081650	29.0984
Fuel Used (gal)	2	.0068254	.0075521	.0071887	.00051384	7.1479
Dist per Run (mi)	2	.024167	.024571	.024369	.00028621	1.1745

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.36977	1.2746	.82219	.63982	77.8190
Total CO (grams)	2	7.2645	11.551	9.4078	3.0311	32.2190
Total NOx (grams)	2	.13091	.23934	.18513	.076671	41.4147
Fuel Used (gal)	2	.0066071	.0080612	.0073342	.0010282	14.0192
Dist per Run (mi)	2	.022571	.023125	.022848	.00039143	1.7132

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.49742	2.3393	1.4183	1.3024	91.8282
Total CO (grams)	2	26.639	28.404	27.521	1.2482	4.5354
Total NOx (grams)	2	.19836	.30191	.25013	.073221	29.2732
Fuel Used (gal)	2	.015545	.016625	.016085	.00076335	4.7457
Dist per Run (mi)	2	.13300	.13680	.13490	.0026870	1.9918

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	1.4197	1.8707	1.6452	.31889	19.3830
Total CO (grams)	2	54.385	56.946	55.666	1.8111	3.2535
Total NOx (grams)	2	.17526	.36760	.27143	.13600	50.1050
Fuel Used (gal)	2	.019538	.021560	.020549	.0014294	6.9561
Dist per Run (mi)	2	.10780	.12700	.11740	.013576	11.5639

Table D12

Acceleration Cycles, with Dynamomter Roll Coupler Installed

Pontiac Firebird

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	3.3516	3.6858	3.4658	.19051	5.4969
Total CO (grams)	3	22.052	24.438	23.171	1.1997	5.1776
Total NOx (grams)	3	.014567	.015762	.015325	.00065957	4.3039
Fuel Used (gal)	3	.0097475	.010516	.010160	.00038732	3.8122
Dist per Run (mi)	3	.031667	.032600	.032144	.00046706	1.4530

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	7.1118	10.347	8.3640	1.7372	20.7700
Total CO (grams)	3	84.802	95.439	91.172	5.6218	6.1661
Total NOx (grams)	3	.11880	.22110	.17201	.051274	29.8087
Fuel Used (gal)	3	.036667	.042750	.039238	.0031488	8.0249
Dist per Run (mi)	3	.16500	.18000	.17200	.0075498	4.3894

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.013930	.36325	.13282	.19960	150.2785
Total CO (grams)	3	.18281	1.7701	.73106	.90027	123.1458
Total NOx (grams)	3	.11393	.26032	.18116	.073920	40.8037
Fuel Used (gal)	3	.0058529	.0076250	.0068494	.00090645	13.2340
Dist per Run (mi)	3	.045250	.049750	.046917	.0024664	5.2569

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.012240	1.5532	.52678	.88887	168.7365
Total CO (grams)	3	1.2116	11.329	4.6351	5.7972	125.0717
Total NOx (grams)	3	.22425	.33552	.26651	.060264	22.6123
Fuel Used (gal)	3	.0060185	.010118	.0078787	.0020756	26.3444
Dist per Run (mi)	3	.032500	.036000	.034300	.0017521	5.1082

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.051826	3.2390	1.3302	1.6846	126.6426
Total CO (grams)	3	6.6711	23.201	14.084	8.3958	59.6123
Total NOx (grams)	3	.051840	.40230	.24256	.17727	73.0829
Fuel Used (gal)	3	.0070301	.011852	.010114	.0026783	26.4811
Dist per Run (mi)	3	.026714	.032000	.029505	.0026552	8.9992

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.23797	3.1822	1.7974	1.4799	82.3356
Total CO (grams)	3	8.3138	20.398	15.718	6.4864	41.2673
Total NOx (grams)	3	.017762	.24931	.15580	.12203	78.3248
Fuel Used (gal)	3	.0066250	.013826	.010007	.0036204	36.1787
Dist per Run (mi)	3	.026500	.031800	.029642	.0027835	9.3904

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.43462	2.3710	1.5661	1.0086	64.4020
Total CO (grams)	3	29.933	73.699	51.048	21.924	42.9478
Total NOx (grams)	3	.20857	.32782	.26758	.059630	22.2849
Fuel Used (gal)	3	.016793	.026806	.022639	.0052128	23.0258
Dist per Run (mi)	3	.14475	.15450	.14919	.0049317	3.3057

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	1.4777	4.1742	2.7932	1.3494	48.3102
Total CO (grams)	3	43.506	68.741	56.428	12.629	22.3807
Total NOx (grams)	3	.077625	.39415	.25177	.16063	63.8002
Fuel Used (gal)	3	.018933	.026928	.022251	.0041674	18.7290
Dist per Run (mi)	3	.12117	.15525	.13792	.017049	12.3615

Table D13

Acceleration Cycles, without Dynamomter Roll Coupler

VW Diesel Rabbit

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.17138	.25600	.21369	.059833	27.9999
Total CO (grams)	2	.34393	.35104	.34748	.0050304	1.4477
Total NOx (grams)	2	.11648	.14128	.12888	.017533	13.6041
Fuel Used (gal)	2	.0031683	.0033565	.0032624	.00013308	4.0792
Dist per Run (mi)	2	.032000	.038600	.035300	.0046669	13.2207

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	1.4938	1.6021	1.5479	.076551	4.9455
Total CO (grams)	2	2.4226	2.7751	2.5989	.24926	9.5910
Total NOx (grams)	2	.53922	.54560	.54241	.0045113	0.8317
Fuel Used (gal)	2	.016645	.018102	.017374	.0010303	5.9301
Dist per Run (mi)	2	.24800	.25800	.25300	.0070711	2.7949

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.27566	.28560	.28063	.0070286	2.5046
Total CO (grams)	2	.58097	.64887	.61492	.048013	7.8080
Total NOx (grams)	2	.21122	.22643	.21883	.010755	4.9148
Fuel Used (gal)	2	.0047222	.0052647	.0049935	.00038359	7.6818
Dist per Run (mi)	2	.042500	.044750	.043625	.0015910	3.6470

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.21594	.27234	.24414	.039881	16.3353
Total CO (grams)	2	.51277	.83909	.67593	.23075	34.1381
Total NOx (grams)	2	.14567	.19936	.17251	.037966	22.0080
Fuel Used (gal)	2	.0041124	.0063571	.0052348	.0015873	30.3221
Dist per Run (mi)	2	.035600	.036600	.036100	.00070711	1.9588

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.19594	.24704	.22149	.036134	16.3140
Total CO (grams)	2	.53294	.87792	.70543	.24393	34.5789
Total NOx (grams)	2	.13332	.18171	.15751	.034216	21.7231
Fuel Used (gal)	2	.0040079	.0059524	.0049802	.0013749	27.6073
Dist per Run (mi)	2	.029167	.033667	.031417	.0031820	10.1283

Table D14

Acceleration Cycles, with Dynamomter Roll Coupler Installed

VW Diesel Rabbit

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.13167	.26530	.21569	.073154	33.9162
Total CO (grams)	3	.35525	.42441	.38442	.035831	9.3208
Total NOx (grams)	3	.12215	.14389	.13065	.011620	8.8940
Fuel Used (gal)	3	.0035833	.0040175	.0037364	.00024382	6.5255
Dist per Run (mi)	3	.034400	.038167	.035856	.0020238	5.6442

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	1.3150	1.6234	1.5018	.16421	10.9342
Total CO (grams)	3	2.5928	2.7875	2.6896	.097335	3.6189
Total NOx (grams)	3	.53768	.62500	.57534	.044880	7.8006
Fuel Used (gal)	3	.017698	.018657	.018229	.00048783	2.6761
Dist per Run (mi)	3	.24600	.25850	.25150	.0063836	2.5382

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.46990	.70003	.54743	.13217	24.1437
Total CO (grams)	3	.57951	1.8948	1.0334	.74630	72.2179
Total NOx (grams)	3	.21506	.63808	.36084	.24021	66.5696
Fuel Used (gal)	3	.0050538	.016389	.0088994	.0064868	72.8903
Dist per Run (mi)	3	.046250	.088500	.060583	.024179	39.9105

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.13120	.52033	.35499	.20104	56.6325
Total CO (grams)	3	.54760	.83569	.64844	.16233	25.0339
Total NOx (grams)	3	.16682	.20998	.18573	.022071	11.8834
Fuel Used (gal)	3	.0043011	.0063279	.0050691	.0010989	21.6784
Dist per Run (mi)	3	.038000	.040000	.038867	.0010263	2.6405

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.11984	.50231	.35454	.20552	57.9680
Total CO (grams)	3	.35951	.76954	.58168	.20716	35.6141
Total NOx (grams)	3	.066292	.21287	.12351	.078396	63.4734
Fuel Used (gal)	3	.0027243	.0060771	.0044651	.0016801	37.6274
Dist per Run (mi)	3	.035143	.038286	.036421	.0016517	4.5350

Table D15

Acceleration Cycles, without Dynamomter Roll Coupler

Saab 900 Turbo

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.0037186	.0072986	.0058774	.0019006	32.3374
Total CO (grams)	3	2.4538	3.1373	2.7208	.36546	13.4321
Total NOx (grams)	3	.034361	.14316	.078420	.057275	73.0362
Fuel Used (gal)	3	.0036029	.0056710	.0044504	.0010833	24.3416
Dist per Run (mi)	3	.018375	.019571	.018887	.00061661	3.2647

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.11929	.18559	.16291	.037780	23.1907
Total CO (grams)	3	1.2728	3.8569	2.7667	1.3385	48.3789
Total NOx (grams)	3	.39937	.49540	.44975	.048187	10.7142
Fuel Used (gal)	3	.018009	.019641	.018865	.00081882	4.3404
Dist per Run (mi)	3	.12767	.14967	.13567	.012166	8.9673

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.012840	.034072	.024096	.010674	44.2978
Total CO (grams)	3	.58807	4.7378	2.0877	2.3017	110.2505
Total NOx (grams)	3	.27606	.43011	.36463	.079577	21.8240
Fuel Used (gal)	3	.0062941	.0077632	.0070360	.00073463	10.4410
Dist per Run (mi)	3	.041600	.044250	.042883	.0013270	3.0945

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.014648	.027030	.022059	.0065417	29.6555
Total CO (grams)	3	2.9692	4.1868	3.6820	.63485	17.2420
Total NOx (grams)	3	.21910	.49867	.40181	.15833	39.4042
Fuel Used (gal)	3	.0047043	.0072481	.0062885	.0013821	21.9782
Dist per Run (mi)	3	.029167	.031800	.030711	.0013745	4.4756

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.043175	.13042	.093829	.045292	48.2708
Total CO (grams)	3	2.3655	3.1296	2.8545	.42456	14.8734
Total NOx (grams)	3	.19834	.72063	.39615	.28325	71.5007
Fuel Used (gal)	3	.0081034	.010467	.0093646	.0011896	12.7032
Dist per Run (mi)	3	.022857	.026167	.024175	.0017549	7.2592

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.017949	.10874	.069542	.046648	67.0789
Total CO (grams)	3	1.5488	2.1469	1.8309	.30050	16.4127
Total NOx (grams)	3	.18424	.39568	.28805	.10577	36.7193
Fuel Used (gal)	3	.0067578	.0091534	.0083133	.0013485	16.2210
Dist per Run (mi)	3	.021625	.024714	.022970	.0015828	6.8907

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.021292	.062352	.040982	.020582	50.2220
Total CO (grams)	3	3.5515	4.2208	3.8683	.33606	8.6875
Total NOx (grams)	3	.44410	.96067	.76999	.28359	36.8303
Fuel Used (gal)	3	.016314	.021833	.019042	.0027602	14.4953
Dist per Run (mi)	3	.12525	.13100	.12783	.0029190	2.2835

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.038912	.074620	.061406	.019579	31.8845
Total CO (grams)	3	1.2104	2.4676	1.6798	.68648	40.8668
Total NOx (grams)	3	.42291	.58737	.49606	.083716	16.8762
Fuel Used (gal)	3	.011989	.013844	.013224	.0010695	8.0876
Dist per Run (mi)	3	.10240	.10660	.10483	.0021779	2.0776

Table D15 (Continued)

Acceleration Cycles, without Dynamomter Roll Coupler (Continued)

Saab 900 Turbo

Acceleration from 30 to 80 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	3	.069000	.14975	.11547	.041731	36.1401
Total CO (grams)	3	.40000	.74481	.52736	.18924	35.8844
Total NOx (grams)	3	.13500	.28083	.21315	.073477	34.4719
Fuel Used (gal)	3	.0076336	.012759	.010579	.0026469	25.0203
Dist per Run (mi)	3	.099833	.11100	.10361	.0063995	6.1765

Acceleration from 30 to 80 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	1	.18953	.18953	.18953	N/A	N/A
Total CO (grams)	1	.27749	.27749	.27749	N/A	N/A
Total NOx (grams)	1	.11519	.11519	.11519	N/A	N/A
Fuel Used (gal)	1	.0088741	.0088741	.0088741	N/A	N/A
Dist per Run (mi)	1	.10471	.10471	.10471	N/A	N/A

Table D16

Acceleration Cycles, with Dynamomter Roll Coupler Installed

Saab 900 Turbo

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.028543	.81989	.42422	.55957	131.9056
Total CO (grams)	2	2.8906	3.0245	2.9575	.094678	3.2013
Total NOx (grams)	2	.084889	.12305	.10397	.026985	25.9546
Fuel Used (gal)	2	.0052857	.0053480	.0053168	.000044032	0.8282
Dist per Run (mi)	2	.020857	.021143	.021000	.00020203	0.9620

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.12692	2.3737	1.2503	1.5887	127.0655
Total CO (grams)	2	1.3677	5.2956	3.3316	2.7774	83.3653
Total NOx (grams)	2	.15080	.49504	.32292	.24341	75.3777
Fuel Used (gal)	2	.0089762	.024792	.016884	.011183	66.2343
Dist per Run (mi)	2	.12567	.15867	.14217	.023335	16.4134

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.012710	.013840	.013275	.00079903	6.0191
Total CO (grams)	2	.62607	.92468	.77538	.21115	27.2318
Total NOx (grams)	2	.21928	.37392	.29660	.10935	36.8678
Fuel Used (gal)	2	.0085417	.0088265	.0086841	.00020143	2.3195
Dist per Run (mi)	2	.041000	.043250	.042125	.0015910	3.7769

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.044936	.049980	.047458	.0035666	7.5153
Total CO (grams)	2	.69339	1.0788	.88611	.27254	30.7569
Total NOx (grams)	2	.26634	.32436	.29535	.041029	13.8917
Fuel Used (gal)	2	.0086316	.0087179	.0086748	.000061073	0.7040
Dist per Run (mi)	2	.032800	.034000	.033400	.00084853	2.5405

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.061790	.082240	.072015	.014460	20.0791
Total CO (grams)	2	2.6834	3.0147	2.8491	.23427	8.2226
Total NOx (grams)	2	.29952	.33400	.31676	.024381	7.6970
Fuel Used (gal)	2	.011034	.011133	.011084	.000069898	0.6306
Dist per Run (mi)	2	.027833	.032000	.029917	.0029463	9.8483

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.095467	.15479	.12513	.041948	33.5235
Total CO (grams)	2	.90735	2.4763	1.6918	1.1094	65.5751
Total NOx (grams)	2	.26565	.32053	.29309	.038808	13.2410
Fuel Used (gal)	2	.010000	.010667	.010333	.00047140	4.5621
Dist per Run (mi)	2	.023000	.026667	.024833	.0025927	10.4405

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.052080	.065025	.058552	.0091535	15.6331
Total CO (grams)	2	.98431	3.5713	2.2778	1.8293	80.3100
Total NOx (grams)	2	.41490	.71017	.56254	.20879	37.1156
Fuel Used (gal)	2	.014966	.021250	.018108	.0044438	24.5405
Dist per Run (mi)	2	.12750	.17360	.15055	.032598	21.6526

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.057824	.069000	.063412	.0079026	12.4623
Total CO (grams)	2	.73837	.86700	.80268	.090957	11.3317
Total NOx (grams)	2	.40950	.41922	.41436	.0068759	1.6594
Fuel Used (gal)	2	.015152	.016353	.015752	.00084954	5.3932
Dist per Run (mi)	2	.11120	.15000	.13060	.027436	21.0077

Table D16 (Continued)

Acceleration Cycles, with Dynamomter Roll Coupler Installed (Continued)

Saab 900 Turbo

Acceleration from 30 to 60 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.14544	.16053	.15299	.010673	6.9763
Total CO (grams)	2	.42771	.82224	.62497	.27898	44.6389
Total NOx (grams)	2	.27749	.31824	.29787	.028812	9.6727
Fuel Used (gal)	2	.011467	.012308	.011887	.00059469	5.0029
Dist per Run (mi)	2	.11467	.14400	.12933	.020742	16.0380

Table D17

Acceleration Cycles, without Dynamomter Roll Coupler

Volvo GL

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	4	.014000	.039737	.021397	.012283	57.4052
Total CO (grams)	4	.086520	.13111	.11683	.020423	17.4810
Total NOx (grams)	4	.075750	.10065	.089069	.010302	11.5663
Fuel Used (gal)	4	.0040094	.0052244	.0046715	.00054376	11.6399
Dist per Run (mi)	4	.021250	.029429	.025711	.0034807	13.5378

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	4	.034000	.12930	.089321	.043876	49.1217
Total CO (grams)	4	.73272	2.3573	1.6464	.68040	41.3265
Total NOx (grams)	4	.44634	.79758	.66848	.15432	23.0852
Fuel Used (gal)	4	.020821	.021250	.021015	.00022064	1.0499
Dist per Run (mi)	4	.14167	.15300	.14767	.0058373	3.9529

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	4	.032305	.057500	.045724	.010366	22.6708
Total CO (grams)	4	.91273	2.0429	1.4805	.50951	34.4147
Total NOx (grams)	4	.26799	.41768	.35765	.064326	17.9857
Fuel Used (gal)	4	.0075893	.0079310	.0077930	.00014541	1.8659
Dist per Run (mi)	4	.042500	.046000	.044625	.0015478	3.4685

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	4	.031772	.048650	.041754	.0071365	17.0918
Total CO (grams)	4	.65504	1.4479	1.1661	.35049	30.0566
Total NOx (grams)	4	.26533	.44109	.37323	.080664	21.6124
Fuel Used (gal)	4	.0077778	.0084500	.0081694	.00033642	4.1181
Dist per Run (mi)	4	.033800	.035000	.034250	.00057446	1.6773

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	4	.019622	.080025	.044842	.026255	58.5500
Total CO (grams)	4	.12481	1.8243	.78995	.73912	93.5654
Total NOx (grams)	4	.14430	.56430	.33322	.17723	53.1871
Fuel Used (gal)	4	.0068440	.0091667	.0079656	.0011256	14.1308
Dist per Run (mi)	4	.026000	.032333	.029500	.0032347	10.9651

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	4	.026783	.053357	.036562	.012372	33.8384
Total CO (grams)	4	.27657	1.3339	.60808	.48804	80.2591
Total NOx (grams)	4	.18131	.45911	.31018	.11777	37.9683
Fuel Used (gal)	4	.0061064	.0083251	.0072960	.0010076	13.8103
Dist per Run (mi)	4	.023714	.031500	.027625	.0042743	15.4726

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	4	.052240	.087262	.065804	.015598	23.7037
Total CO (grams)	4	.37765	1.0552	.60264	.30757	51.0371
Total NOx (grams)	4	.21712	.42826	.36194	.097441	26.9219
Fuel Used (gal)	4	.015130	.018908	.016641	.0016137	9.6971
Dist per Run (mi)	4	.13150	.16325	.14356	.014407	10.0355

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	4	.041088	.058590	.050342	.0080697	16.0298
Total CO (grams)	4	.20929	.61824	.43512	.19744	45.3760
Total NOx (grams)	4	.25469	.35154	.28627	.044353	15.4934
Fuel Used (gal)	4	.012588	.014000	.013017	.00065906	5.0631
Dist per Run (mi)	4	.12840	.13620	.13090	.0036166	2.7629

Table D18

Acceleration Cycles, with Dynamomter Roll Coupler Installed

Volvo GL

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.021000	.024137	.022569	.0022183	9.8290
Total CO (grams)	2	.13325	.18907	.16116	.039474	24.4937
Total NOx (grams)	2	.11350	.12471	.11910	.0079257	6.6547
Fuel Used (gal)	2	.0054348	.0062857	.0058602	.00060170	10.2676
Dist per Run (mi)	2	.025000	.025143	.025071	.00010102	0.4029

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.12144	.16368	.14256	.029868	20.9512
Total CO (grams)	2	1.4202	2.0071	1.7137	.41505	24.2195
Total NOx (grams)	2	.79029	.79442	.79236	.0029180	0.3683
Fuel Used (gal)	2	.025556	.027104	.026330	.0010948	4.1580
Dist per Run (mi)	2	.16533	.16867	.16700	.0023570	1.4114

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.026040	.047470	.036755	.015153	41.2270
Total CO (grams)	2	.17112	1.1303	.65073	.67828	104.2337
Total NOx (grams)	2	.23436	.38070	.30753	.10348	33.6487
Fuel Used (gal)	2	.0089423	.0090385	.0089904	.000067991	0.7563
Dist per Run (mi)	2	.046500	.047000	.046750	.00035355	0.7563

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.050864	.058056	.054460	.0050855	9.3380
Total CO (grams)	2	.88677	.94323	.91500	.039922	4.3631
Total NOx (grams)	2	.16426	.33249	.24837	.11896	47.8963
Fuel Used (gal)	2	.0098333	.0098421	.0098377	.0000062027	0.0631
Dist per Run (mi)	2	.035400	.037400	.036400	.0014142	3.8852

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.031584	.070964	.051274	.027846	54.3082
Total CO (grams)	2	.19286	1.2805	.73668	.76907	104.3967
Total NOx (grams)	2	.15658	.32970	.24314	.12242	50.3496
Fuel Used (gal)	2	.010839	.011214	.011026	.00026557	2.4086
Dist per Run (mi)	2	.031400	.033600	.032500	.0015556	4.7865

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.047333	.079483	.063408	.022733	35.8520
Total CO (grams)	2	.64567	1.2347	.94017	.41650	44.3005
Total NOx (grams)	2	.22833	.32648	.27741	.069403	25.0182
Fuel Used (gal)	2	.0087719	.010920	.0098457	.0015186	15.4240
Dist per Run (mi)	2	.031667	.033333	.032500	.0011785	3.6262

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.079950	.081090	.080520	.00080610	1.0011
Total CO (grams)	2	.80411	.83316	.81864	.020540	2.5090
Total NOx (grams)	2	.34185	.43819	.39002	.068121	17.4660
Fuel Used (gal)	2	.018088	.019390	.018739	.00092066	4.9131
Dist per Run (mi)	2	.15375	.15900	.15637	.0037123	2.3741

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
Total HC (grams)	2	.059356	.060138	.059747	.00055296	0.9255
Total CO (grams)	2	.41862	.54433	.48147	.088890	18.4622
Total NOx (grams)	2	.25929	.26677	.26303	.0052849	2.0092
Fuel Used (gal)	2	.014547	.014598	.014573	.000036035	0.2473
Dist per Run (mi)	2	.15420	.15620	.15520	.0014142	0.9112

Table D19

Acceleration Cycles, without Dynamomter Roll Coupler

Ford Pinto

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	1.6800	2.7500	2.2150	0.75660	34.158
CO (grams/mi)	2	135.35	184.90	160.12	35.037	21.882
NOx (grams/mi)	2	1.9500	3.7100	2.8300	1.2445	43.975
Fuel Economy (mpg)	2	3.4000	4.6000	4.0000	0.84853	21.213

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	0.84000	0.94000	0.89000	0.070711	7.945
CO (grams/mi)	2	42.280	46.830	44.555	3.2173	7.221
NOx (grams/mi)	2	2.1300	2.1400	2.1350	0.0070711	0.331
Fuel Economy (mpg)	2	8.8000	9.1000	8.9500	0.21213	2.370

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	1.3300	2.0100	1.6700	0.48083	28.792
CO (grams/mi)	2	19.320	23.620	21.470	3.0406	14.162
NOx (grams/mi)	2	3.8100	4.2200	4.0150	0.28991	7.221
Fuel Economy (mpg)	2	5.7000	6.6000	6.1500	0.63640	10.348

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	0.95000	1.9700	1.4600	0.72125	49.401
CO (grams/mi)	2	41.950	50.640	46.295	6.1448	13.273
NOx (grams/mi)	2	4.5000	5.5900	5.0450	0.77075	15.278
Fuel Economy (mpg)	2	4.2000	5.9000	5.0500	1.2021	23.804

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	1.2600	1.9900	1.6250	0.51619	31.766
CO (grams/mi)	2	50.580	126.68	88.630	53.811	60.714
NOx (grams/mi)	2	5.9900	7.0100	6.5000	0.72125	11.096
Fuel Economy (mpg)	2	3.1000	4.3000	3.7000	0.84853	22.933

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	0.97000	3.8700	2.4200	2.0506	84.736
CO (grams/mi)	2	49.300	157.72	103.51	76.665	74.065
NOx (grams/mi)	2	3.4900	6.8400	5.1650	2.3688	45.863
Fuel Economy (mpg)	2	3.1000	6.5000	4.8000	2.4042	50.087

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	0.43000	0.47000	0.45000	0.028284	6.285
CO (grams/mi)	2	30.900	31.930	31.415	0.72832	2.318
NOx (grams/mi)	2	1.4200	1.6500	1.5350	0.16263	10.595
Fuel Economy (mpg)	2	12.300	12.500	12.400	0.14142	1.140

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	0.59000	0.68000	0.63500	0.063640	10.022
CO (grams/mi)	2	26.750	27.740	27.245	0.70004	2.569
NOx (grams/mi)	2	1.3300	1.3500	1.3400	0.014142	1.055
Fuel Economy (mpg)	2	12.200	13.000	12.600	0.56569	4.490

Table D20

Acceleration Cycles, with Dynamomter Roll Coupler Installed

Ford Pinto

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	5	0.96000	1.8000	1.3120	0.35591	27.127
CO (grams/mi)	5	81.060	138.70	110.87	22.995	20.740
NOx (grams/mi)	5	3.2800	5.3000	4.0900	0.79278	19.383
Fuel Economy (mpg)	5	3.9000	6.6000	4.8400	1.0359	21.403

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	5	1.0900	1.4800	1.2780	0.16843	13.179
CO (grams/mi)	5	43.590	54.260	48.162	4.4603	9.261
NOx (grams/mi)	5	2.0100	3.0800	2.4880	0.43803	17.606
Fuel Economy (mpg)	5	7.7000	12.000	8.9000	1.7593	19.767

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	5	0.22000	1.9500	0.73200	0.70652	96.519
CO (grams/mi)	5	3.5100	40.530	12.504	15.770	126.120
NOx (grams/mi)	5	2.1300	4.4800	3.2360	0.96754	29.899
Fuel Economy (mpg)	5	5.5000	9.5000	7.7400	1.7813	23.014

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	5	0.66000	1.1900	0.90400	0.21617	23.913
CO (grams/mi)	5	6.9700	38.520	22.634	12.340	54.520
NOx (grams/mi)	5	2.4300	7.6200	5.2080	1.9514	37.469
Fuel Economy (mpg)	5	3.8000	8.5000	6.2000	1.9105	30.814

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	5	0.54000	1.8800	1.2780	0.54824	42.898
CO (grams/mi)	5	7.8800	94.250	62.618	33.496	53.493
NOx (grams/mi)	5	2.7400	8.9700	6.0660	2.6288	43.337
Fuel Economy (mpg)	5	3.6000	8.0000	5.1200	1.7283	33.756

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	1	1.9500	1.9500	1.9500	N.A.	N.A.
CO (grams/mi)	1	99.690	99.690	99.690	N.A.	N.A.
NOx (grams/mi)	1	6.4600	6.4600	6.4600	N.A.	N.A.
Fuel Economy (mpg)	1	6.1000	6.1000	6.1000	N.A.	N.A.

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	4	0.23000	1.1800	0.72000	0.39758	55.219
CO (grams/mi)	4	24.160	42.150	31.682	7.9291	25.027
NOx (grams/mi)	4	1.2600	2.3800	1.7700	0.55106	31.133
Fuel Economy (mpg)	4	7.3000	13.000	10.850	2.4906	22.955

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	0.43000	0.92000	0.67000	0.24515	36.590
CO (grams/mi)	3	23.730	30.780	28.237	3.9136	13.860
NOx (grams/mi)	3	1.1500	1.6400	1.3900	0.24515	17.637
Fuel Economy (mpg)	3	9.7000	12.600	11.233	1.4572	12.972

Acceleration from 30 to 60 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	1	0.79000	0.79000	0.79000	N.A.	N.A.
CO (grams/mi)	1	37.100	37.100	37.100	N.A.	N.A.
NOx (grams/mi)	1	1.4000	1.4000	1.4000	N.A.	N.A.
Fuel Economy (mpg)	1	10.900	10.900	10.900	N.A.	N.A.

Table D21

Acceleration Cycles, without Dynamomter Roll Coupler

Chevrolet Impala

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	10.520	10.960	10.740	0.31113	2.897
CO (grams/mi)	2	89.090	93.870	91.480	3.3800	3.695
NOx (grams/mi)	2	28.690	31.560	30.125	2.0294	6.737
Fuel Economy (mpg)	2	4.3000	4.6000	4.4500	0.21213	4.767

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	10.800	11.310	11.055	0.36062	3.262
CO (grams/mi)	2	66.880	85.110	75.995	12.891	16.963
NOx (grams/mi)	2	36.460	37.870	37.165	0.99702	2.683
Fuel Economy (mpg)	2	3.8000	3.8000	3.8000	0.0	0.0

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	12.130	15.880	14.005	2.6517	18.934
CO (grams/mi)	2	142.51	309.74	226.12	118.25	52.295
NOx (grams/mi)	2	36.160	36.270	36.215	0.077782	0.215
Fuel Economy (mpg)	2	2.5000	3.5000	3.0000	0.70711	23.570

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	14.470	27.310	20.890	9.0793	43.462
CO (grams/mi)	2	281.89	895.99	588.94	434.23	73.731
NOx (grams/mi)	2	38.320	39.310	38.815	0.70004	1.804
Fuel Economy (mpg)	2	1.5000	2.7000	2.1000	0.84853	40.406

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	7.2000	7.7000	7.4500	0.35355	4.746
CO (grams/mi)	2	267.46	303.87	285.66	25.746	9.013
NOx (grams/mi)	2	8.5000	9.7100	9.1050	0.85560	9.397
Fuel Economy (mpg)	2	5.2000	5.7000	5.4500	0.35355	6.487

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	8.1800	8.5600	8.3700	0.26870	3.210
CO (grams/mi)	2	353.59	381.59	367.59	19.799	5.386
NOx (grams/mi)	2	8.5600	11.720	10.140	2.2345	22.036
Fuel Economy (mpg)	2	4.2000	4.7000	4.4500	0.35355	7.945

Acceleration from 30 to 60 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	9.8600	11.250	10.555	0.98288	9.312
CO (grams/mi)	2	444.00	553.67	498.83	77.548	15.546
NOx (grams/mi)	2	8.1000	8.9100	8.5050	0.57276	6.734
Fuel Economy (mpg)	2	3.6000	4.3000	3.9500	0.49497	12.531

Acceleration from 30 to 60 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	3.0800	8.5900	5.8350	3.8962	66.773
CO (grams/mi)	2	422.92	495.85	459.38	51.569	11.226
NOx (grams/mi)	2	7.4100	8.8200	8.1150	0.99702	12.286
Fuel Economy (mpg)	2	4.0000	4.6000	4.3000	0.42426	9.867

Table D22

Acceleration Cycles, with Dynamomter Roll Coupler Installed

Chevrolet Impala

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	24.950	28.180	26.563	1.6150	6.080
CO (grams/mi)	3	19.840	25.800	23.647	3.3061	13.981
NOx (grams/mi)	3	7.8200	8.6900	8.1167	0.49662	6.118
Fuel Economy (mpg)	3	3.3000	3.4000	3.3667	0.057735	1.715

Acceleration from 0 to 60 at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	12.390	13.420	12.833	0.52975	4.128
CO (grams/mi)	3	0.74000	2.8800	1.6200	1.1195	69.105
NOx (grams/mi)	3	7.5200	7.7100	7.6200	0.095394	1.252
Fuel Economy (mpg)	3	6.9000	7.2000	7.0667	0.15275	2.162

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	7	9.4300	28.410	13.296	6.7945	51.102
CO (grams/mi)	7	66.880	192.40	102.27	44.059	43.081
NOx (grams/mi)	7	23.340	30.530	26.890	2.5262	9.395
Fuel Economy (mpg)	7	3.4000	5.7000	4.6000	0.72111	15.676

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	7	9.2500	15.530	12.083	2.2120	18.307
CO (grams/mi)	7	65.280	217.56	120.33	61.517	51.124
NOx (grams/mi)	7	27.220	38.670	32.739	3.8666	11.810
Fuel Economy (mpg)	7	2.9000	4.8000	3.8857	0.69144	17.794

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	7	11.080	22.290	14.633	4.0165	27.448
CO (grams/mi)	7	64.370	628.47	202.09	204.48	101.183
NOx (grams/mi)	7	25.170	37.900	32.541	4.7557	14.614
Fuel Economy (mpg)	7	1.9000	4.2000	3.4143	0.84741	24.819

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	17.500	18.870	17.963	0.78526	4.372
CO (grams/mi)	3	364.14	455.13	403.43	46.749	11.588
NOx (grams/mi)	3	32.240	36.680	33.860	2.4512	7.239
Fuel Economy (mpg)	3	2.2000	2.4000	2.3000	0.10000	4.348

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	7	5.1800	9.3100	7.2043	1.2990	18.031
CO (grams/mi)	7	3.4200	372.43	124.06	156.02	125.762
NOx (grams/mi)	7	6.0900	10.560	7.9243	1.5513	19.576
Fuel Economy (mpg)	7	4.5000	10.800	8.2000	2.6696	32.556

Acceleration from 30 to 60 mph at 3 mph per sec *(Test numbers 1 to 4 only)*

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	4	6.4900	7.5800	6.9675	0.4544	6.522
CO (grams/mi)	4	3.4200	7.1200	4.9350	1.6078	32.579
NOx (grams/mi)	4	6.0900	8.2100	7.1000	0.8970	12.634
Fuel Economy (mpg)	4	9.5000	10.800	10.225	0.6752	6.603

Table D22 (Continued)

Acceleration Cycles, with Dynamomter Roll Coupler Installed (Continued)

Chevrolet Impala

Acceleration from 30 to 60 mph at 3 mph per sec *(Test numbers 5 to 7 only)*

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	5.1800	9.3100	7.5200	2.1192	28.181
CO (grams/mi)	3	209.95	372.43	282.89	82.503	29.165
NOx (grams/mi)	3	7.2200	10.560	9.0233	1.6859	18.684
Fuel Economy (mpg)	3	4.5000	6.9000	5.5000	1.2490	22.709

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	7	6.6700	9.9900	8.4829	1.2773	15.057
CO (grams/mi)	7	0.0	469.75	173.82	216.36	124.474
NOx (grams/mi)	7	4.1600	6.7700	5.8171	0.93527	16.078
Fuel Economy (mpg)	7	4.3000	11.800	8.5714	3.5785	41.749

Acceleration from 30 to 60 mph at 4 mph per sec *(Test numbers 1 to 4 only)*

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	4	6.6700	9.7100	8.0650	1.2836	15.915
CO (grams/mi)	4	0.0	8.5800	2.7725	3.9279	141.675
NOx (grams/mi)	4	4.1600	6.4900	5.6575	1.0297	18.201
Fuel Economy (mpg)	4	11.000	11.800	11.425	0.3304	2.892

Acceleration from 30 to 60 mph at 4 mph per sec *(Test numbers 5 to 7 only)*

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	7.6000	9.9900	9.0400	1.2681	14.028
CO (grams/mi)	3	347.29	469.75	401.87	62.303	15.503
NOx (grams/mi)	3	4.9500	6.7700	6.0300	0.9565	15.862
Fuel Economy (mpg)	3	4.3000	5.3000	4.7667	0.5033	10.559

Acceleration from 30 to 60 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	6	8.2800	11.020	9.5500	1.0843	11.354
CO (grams/mi)	6	0.0	528.86	243.71	268.76	110.279
NOx (grams/mi)	6	5.0000	9.0100	6.7400	1.6097	23.883
Fuel Economy (mpg)	6	3.6000	13.900	8.2333	4.6945	57.018

Acceleration from 30 to 60 mph at 5 mph per sec *(Test numbers 1 to 4 only)*

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	8.2800	8.8800	8.6167	0.3066	3.559
CO (grams/mi)	3	0.0	0.2400	0.0800	0.1386	173.205
NOx (grams/mi)	3	5.0000	5.7800	5.4833	0.4222	7.699
Fuel Economy (mpg)	3	11.100	13.900	12.433	1.4048	11.298

Acceleration from 30 to 60 mph at 5 mph per sec *(Test numbers 5 to 7 only)*

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	10.090	11.020	10.483	0.4813	4.591
CO (grams/mi)	3	431.57	528.86	487.34	50.185	10.298
NOx (grams/mi)	3	6.6000	9.0100	7.9967	1.2499	15.630
Fuel Economy (mpg)	3	3.6000	4.5000	4.0333	0.4509	11.180

Acceleration from 30 to 60 mph at 6 mph per sec *(Only tests 5 to 7 run)*

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	7.7600	11.030	9.5000	1.6451	17.317
CO (grams/mi)	3	342.02	553.46	445.27	105.81	23.763
NOx (grams/mi)	3	6.8600	9.8500	8.0433	1.5895	19.762
Fuel Economy (mpg)	3	3.5000	5.3000	4.3667	0.90185	20.653

Table D23

Acceleration Cycles, without Dynamomter Roll Coupler

Pontiac Firebird

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	130.85	136.00	133.42	3.6416	2.729
CO (grams/mi)	2	630.98	812.07	721.52	128.05	17.747
NOx (grams/mi)	2	0.53000	0.79000	0.66000	0.18385	27.856
Fuel Economy (mpg)	2	2.6000	2.7000	2.6500	0.070711	2.668

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	51.900	57.780	54.840	4.1578	7.582
CO (grams/mi)	2	597.81	612.25	605.03	10.211	1.688
NOx (grams/mi)	2	1.5500	1.6200	1.5850	0.049497	3.123
Fuel Economy (mpg)	2	3.7000	3.8000	3.7500	0.070711	1.886

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	0.66000	1.1400	0.90000	0.33941	37.712
CO (grams/mi)	2	2.8100	144.60	73.705	100.26	136.029
NOx (grams/mi)	2	2.3300	2.5000	2.4150	0.12021	4.978
Fuel Economy (mpg)	2	6.8000	7.4000	7.1000	0.42426	5.975

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	0.78000	1.0200	0.90000	0.16971	18.857
CO (grams/mi)	2	16.720	50.580	33.650	23.943	71.153
NOx (grams/mi)	2	6.4800	7.6000	7.0400	0.79196	11.249
Fuel Economy (mpg)	2	4.7000	5.2000	4.9500	0.35355	7.142

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	7.6700	9.1900	8.4300	1.0748	12.750
CO (grams/mi)	2	150.20	189.74	169.97	27.959	16.449
NOx (grams/mi)	2	9.0700	14.000	11.535	3.4860	30.221
Fuel Economy (mpg)	2	3.2000	3.6000	3.4000	0.28284	8.319

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	15.990	56.470	36.230	28.624	79.006
CO (grams/mi)	2	314.14	511.76	412.95	139.74	33.839
NOx (grams/mi)	2	5.8000	10.350	8.0750	3.2173	39.843
Fuel Economy (mpg)	2	2.8000	3.5000	3.1500	0.49497	15.713

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	3.7400	17.100	10.420	9.4469	90.661
CO (grams/mi)	2	200.29	207.63	203.96	5.1902	2.545
NOx (grams/mi)	2	1.4500	2.2700	1.8600	0.57983	31.174
Fuel Economy (mpg)	2	8.0000	8.8000	8.4000	0.56569	6.734

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	13.170	14.730	13.950	1.1031	7.908
CO (grams/mi)	2	428.23	528.26	478.24	70.732	14.790
NOx (grams/mi)	2	1.3800	3.4100	2.3950	1.4354	59.933
Fuel Economy (mpg)	2	5.0000	6.5000	5.7500	1.0607	18.447

Table D24

Acceleration Cycles, with Dynamomter Roll Coupler Installed

Pontiac Firebird

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	104.46	113.06	107.79	4.6187	4.285
CO (grams/mi)	3	696.38	749.62	720.57	26.951	3.740
NOx (grams/mi)	3	0.46000	0.49000	0.47667	0.015275	3.205
Fuel Economy (mpg)	3	3.1000	3.3000	3.1667	0.11547	3.646

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	38.510	60.510	48.760	10.721	21.987
CO (grams/mi)	3	513.95	558.12	530.09	24.368	4.597
NOx (grams/mi)	3	0.66000	1.3400	1.0100	0.34044	33.707
Fuel Economy (mpg)	3	4.0000	4.7000	4.4000	0.36056	8.195

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	0.28000	7.9400	2.8967	4.3687	150.816
CO (grams/mi)	3	4.0400	38.690	15.853	19.781	124.778
NOx (grams/mi)	3	2.2900	5.6900	3.9067	1.7061	43.671
Fuel Economy (mpg)	3	6.0000	8.5000	6.9667	1.3429	19.276

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	0.34000	45.150	15.317	25.836	168.675
CO (grams/mi)	3	37.280	329.32	134.84	168.42	124.904
NOx (grams/mi)	3	6.9000	9.3200	7.7300	1.3774	17.819
Fuel Economy (mpg)	3	3.4000	5.4000	4.5333	1.0263	22.639

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	1.9400	101.22	42.213	52.224	123.715
CO (grams/mi)	3	249.72	725.04	463.40	241.26	52.063
NOx (grams/mi)	3	1.6200	13.500	8.4533	6.1382	72.613
Fuel Economy (mpg)	3	2.6000	3.8000	3.0333	0.66583	21.951

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	8.9800	103.91	58.300	47.574	81.602
CO (grams/mi)	3	313.73	641.45	519.12	178.96	34.474
NOx (grams/mi)	3	0.58000	7.8400	5.3267	4.1131	77.217
Fuel Economy (mpg)	3	2.3000	4.0000	3.1667	0.85049	26.857

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	2.9300	16.380	10.520	6.8899	65.493
CO (grams/mi)	3	193.74	509.15	345.56	158.03	45.732
NOx (grams/mi)	3	1.3500	2.2100	1.8000	0.43139	23.966
Fuel Economy (mpg)	3	5.4000	9.2000	6.9000	2.0224	29.310

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	10.760	34.450	20.927	12.196	58.279
CO (grams/mi)	3	280.23	500.54	417.17	119.53	28.653
NOx (grams/mi)	3	0.50000	2.8700	1.9033	1.2439	65.355
Fuel Economy (mpg)	3	5.1000	8.2000	6.3667	1.6258	25.536

Table D25

Acceleration Cycles, without Dynamomter Roll Coupler

VW Diesel Rabbit

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	4.4400	8.0000	6.2200	2.5173	40.471
CO (grams/mi)	2	8.9100	10.970	9.9400	1.4566	14.654
NOx (grams/mi)	2	3.6400	3.6600	3.6500	0.014142	0.387
Fuel Economy (mpg)	2	10.100	11.500	10.800	0.98995	9.166

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	5.7900	6.4600	6.1250	0.47376	7.735
CO (grams/mi)	2	9.3900	11.190	10.290	1.2728	12.369
NOx (grams/mi)	2	2.0900	2.2000	2.1450	0.077782	3.626
Fuel Economy (mpg)	2	13.700	15.500	14.600	1.2728	8.718

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	6.1600	6.7200	6.4400	0.39598	6.149
CO (grams/mi)	2	13.670	14.500	14.085	0.58690	4.167
NOx (grams/mi)	2	4.9700	5.0600	5.0150	0.063640	1.269
Fuel Economy (mpg)	2	8.5000	9.0000	8.7500	0.35355	4.041

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	5.9000	7.6500	6.7750	1.2374	18.264
CO (grams/mi)	2	14.010	23.570	18.790	6.7599	35.976
NOx (grams/mi)	2	3.9800	5.6000	4.7900	1.1455	23.914
Fuel Economy (mpg)	2	5.6000	8.9000	7.2500	2.3335	32.186

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	5.8200	8.4700	7.1450	1.8738	26.225
CO (grams/mi)	2	15.830	30.100	22.965	10.090	43.936
NOx (grams/mi)	2	3.9600	6.2300	5.0950	1.6051	31.503
Fuel Economy (mpg)	2	4.9000	8.4000	6.6500	2.4749	37.217

Table D26

Acceleration Cycles, with Dynamomter Roll Coupler Installed

VW Diesel Rabbit

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	3.4500	7.5800	6.1000	2.3002	37.708
CO (grams/mi)	3	10.150	11.120	10.710	0.50210	4.688
NOx (grams/mi)	3	3.4900	3.7700	3.6400	0.14107	3.876
Fuel Economy (mpg)	3	9.5000	9.7000	9.6000	0.10000	1.042

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	5.2600	6.3700	5.9700	0.61652	10.327
CO (grams/mi)	3	10.400	11.150	10.697	0.39879	3.728
NOx (grams/mi)	3	2.0800	2.5000	2.2900	0.21000	9.170
Fuel Economy (mpg)	3	13.400	14.100	13.800	0.36056	2.613

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	7.9100	10.160	9.3733	1.2685	13.533
CO (grams/mi)	3	12.530	21.410	15.753	4.9147	31.198
NOx (grams/mi)	3	4.6500	7.2100	5.5800	1.4163	25.382
Fuel Economy (mpg)	3	5.4000	9.3000	7.8333	2.1221	27.091

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	3.2800	13.480	9.2133	5.3003	57.529
CO (grams/mi)	3	13.690	21.650	16.710	4.3134	25.813
NOx (grams/mi)	3	4.3900	5.4400	4.7800	0.57472	12.023
Fuel Economy (mpg)	3	6.1000	9.3000	7.9000	1.6371	20.723

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	3.4100	13.120	9.6167	5.3900	56.048
CO (grams/mi)	3	10.230	20.100	15.840	5.0716	32.018
NOx (grams/mi)	3	1.8500	5.5600	3.3367	1.9616	58.789
Fuel Economy (mpg)	3	6.3000	12.900	9.0000	3.4598	38.442

Table D27

Acceleration Cycles, without Dynamomter Roll Coupler

Saab 900 Turbo

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	0.19000	0.39000	0.31333	0.10786	34.424
CO (grams/mi)	3	131.12	160.30	143.78	14.967	10.410
NOx (grams/mi)	3	1.8700	7.6500	4.1567	3.0731	73.931
Fuel Economy (mpg)	3	3.3000	5.1000	4.4000	0.96437	21.917

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	0.92000	1.4400	1.2000	0.26230	21.858
CO (grams/mi)	3	9.9700	25.770	20.063	8.7660	43.692
NOx (grams/mi)	3	3.0800	3.5600	3.3167	0.24007	7.238
Fuel Economy (mpg)	3	6.5000	7.9000	7.2000	0.70000	9.722

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	0.30000	0.77000	0.56000	0.23896	42.671
CO (grams/mi)	3	13.740	113.89	49.603	55.798	112.489
NOx (grams/mi)	3	6.4500	9.7200	8.4967	1.7837	20.993
Fuel Economy (mpg)	3	5.7000	6.8000	6.1333	0.58595	9.554

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	0.47000	0.85000	0.72000	0.21656	30.078
CO (grams/mi)	3	95.270	133.37	120.10	21.520	17.918
NOx (grams/mi)	3	6.8900	16.720	13.203	5.4793	41.500
Fuel Economy (mpg)	3	4.3000	6.2000	5.0333	1.0214	20.293

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	1.6500	5.5500	3.9733	2.0544	51.705
CO (grams/mi)	3	100.66	136.92	118.28	18.152	15.347
NOx (grams/mi)	3	8.4400	27.540	15.923	10.199	64.052
Fuel Economy (mpg)	3	2.4000	2.9000	2.6000	0.26458	10.176

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	0.83000	4.4000	2.9533	1.8787	63.614
CO (grams/mi)	3	71.620	86.870	79.370	7.6281	9.611
NOx (grams/mi)	3	8.5200	17.530	12.517	4.5902	36.672
Fuel Economy (mpg)	3	2.5000	3.2000	2.8000	0.36056	12.877

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	0.17000	0.49000	0.32000	0.16093	50.291
CO (grams/mi)	3	27.910	32.220	30.243	2.1770	7.198
NOx (grams/mi)	3	3.4900	7.6700	6.0233	2.2266	36.966
Fuel Economy (mpg)	3	6.0000	7.8000	6.8000	0.91652	13.478

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	0.38000	0.70000	0.58333	0.17673	30.297
CO (grams/mi)	3	11.820	23.390	15.993	6.4233	40.163
NOx (grams/mi)	3	4.1300	5.5100	4.7233	0.71002	15.032
Fuel Economy (mpg)	3	7.4000	8.8000	7.9667	0.73711	9.252

Table D27 (Continued)

Acceleration Cycles, without Dynamomter Roll Coupler (Continued)

Saab 900 Turbo

Acceleration from 30 to 60 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	3	0.69000	1.5000	1.1133	0.40624	36.490
CO (grams/mi)	3	4.0000	6.7100	5.0300	1.4673	29.171
NOx (grams/mi)	3	1.3500	2.5300	2.0400	0.61490	30.142
Fuel Economy (mpg)	3	8.7000	13.100	10.200	2.5120	24.627

Acceleration from 30 to 60 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	1	1.8100	1.8100	1.8100	N.A.	N.A.
CO (grams/mi)	1	2.6500	2.6500	2.6500	N.A.	N.A.
NOx (grams/mi)	1	1.1000	1.1000	1.1000	N.A.	N.A.
Fuel Economy (mpg)	1	11.800	11.800	11.800	N.A.	N.A.

Table D28

Acceleration Cycles, with Dynamomter Roll Coupler Installed

Saab 900 Turbo

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	1.3500	39.310	20.330	26.842	132.031
CO (grams/mi)	2	138.59	143.05	140.82	3.1537	2.240
NOx (grams/mi)	2	4.0700	5.8200	4.9450	1.2374	25.023
Fuel Economy (mpg)	2	3.9000	4.0000	3.9500	0.070711	1.790

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	1.0100	14.960	7.9850	9.8641	123.533
CO (grams/mi)	2	8.6200	42.140	25.380	23.702	93.388
NOx (grams/mi)	2	1.2000	3.1200	2.1600	1.3576	62.852
Fuel Economy (mpg)	2	6.4000	14.000	10.200	5.3740	52.686

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	0.31000	0.32000	0.31500	0.0070711	2.245
CO (grams/mi)	2	15.270	21.380	18.325	4.3204	23.577
NOx (grams/mi)	2	5.0700	9.1200	7.0950	2.8638	40.364
Fuel Economy (mpg)	2	4.8000	4.9000	4.8500	0.070711	1.458

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	1.3700	1.4700	1.4200	0.070711	4.980
CO (grams/mi)	2	21.140	31.730	26.435	7.4883	28.327
NOx (grams/mi)	2	8.1200	9.5400	8.8300	1.0041	11.371
Fuel Economy (mpg)	2	3.8000	3.9000	3.8500	0.070711	1.837

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	2.2200	2.5700	2.3950	0.24749	10.334
CO (grams/mi)	2	94.210	96.410	95.310	1.5556	1.632
NOx (grams/mi)	2	9.3600	12.000	10.680	1.8668	17.479
Fuel Economy (mpg)	2	2.5000	2.9000	2.7000	0.28284	10.476

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	3.5800	6.7300	5.1550	2.2274	43.209
CO (grams/mi)	2	39.450	92.860	66.155	37.767	57.089
NOx (grams/mi)	2	11.550	12.020	11.785	0.33234	2.820
Fuel Economy (mpg)	2	2.3000	2.5000	2.4000	0.14142	5.893

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	0.30000	0.51000	0.40500	0.14849	36.664
CO (grams/mi)	2	5.6700	28.010	16.840	15.797	93.806
NOx (grams/mi)	2	2.3900	5.5700	3.9800	2.2486	56.497
Fuel Economy (mpg)	2	6.0000	11.600	8.8000	3.9598	44.998

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	0.46000	0.52000	0.49000	0.042426	8.658
CO (grams/mi)	2	5.7800	6.6400	6.2100	0.60811	9.792
NOx (grams/mi)	2	2.7300	3.7700	3.2500	0.73539	22.627
Fuel Economy (mpg)	2	6.8000	9.9000	8.3500	2.1920	26.251

Acceleration from 30 to 60 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	1.0100	1.4000	1.2050	0.27577	22.885
CO (grams/mi)	2	3.7300	5.7100	4.7200	1.4001	29.663
NOx (grams/mi)	2	2.2100	2.4200	2.3150	0.14849	6.414
Fuel Economy (mpg)	2	10.000	11.700	10.850	1.2021	11.079

Table D29

Acceleration Cycles, without Dynamomter Roll Coupler

Volvo GL

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	4	0.51000	1.8700	0.89000	0.65488	73.582
CO (grams/mi)	4	2.9400	6.1700	4.6750	1.3364	28.586
NOx (grams/mi)	4	3.0300	4.3100	3.5025	0.56151	16.032
Fuel Economy (mpg)	4	5.2000	5.9000	5.5000	0.31623	5.750

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	4	0.24000	0.90000	0.60250	0.29669	49.243
CO (grams/mi)	4	4.8100	16.640	11.272	4.9636	44.035
NOx (grams/mi)	4	2.9300	5.6300	4.5550	1.1747	25.789
Fuel Economy (mpg)	4	6.8000	7.2000	7.0250	0.20616	2.935

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	4	0.71000	1.2500	1.0250	0.22650	22.098
CO (grams/mi)	4	20.060	44.410	33.105	10.890	32.895
NOx (grams/mi)	4	5.8900	9.0800	8.0225	1.4450	18.012
Fuel Economy (mpg)	4	5.6000	5.8000	5.7250	0.095743	1.672

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	4	0.94000	1.3900	1.2175	0.19500	16.016
CO (grams/mi)	4	19.380	41.370	33.972	9.9371	29.251
NOx (grams/mi)	4	7.8500	13.050	10.887	2.3065	21.186
Fuel Economy (mpg)	4	4.0000	4.5000	4.2000	0.24495	5.832

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	4	0.61000	2.9100	1.5875	1.0263	64.649
CO (grams/mi)	4	3.8800	66.340	28.377	27.487	96.864
NOx (grams/mi)	4	5.5500	20.520	11.355	6.5138	57.365
Fuel Economy (mpg)	4	3.0000	4.7000	3.8000	0.92736	24.404

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	4	0.86000	2.2500	1.3950	0.66345	47.559
CO (grams/mi)	4	8.7800	56.250	23.800	21.882	91.941
NOx (grams/mi)	4	7.5100	19.360	11.512	5.4137	47.027
Fuel Economy (mpg)	4	2.9000	5.1000	3.9000	1.1165	28.628

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	4	0.32000	0.65000	0.46750	0.14477	30.967
CO (grams/mi)	4	2.6000	7.8600	4.2800	2.4133	56.385
NOx (grams/mi)	4	1.3300	3.1900	2.5825	0.85094	32.950
Fuel Economy (mpg)	4	7.1000	9.9000	8.7000	1.2987	14.928

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	4	0.32000	0.45000	0.38500	0.064550	16.766
CO (grams/mi)	4	1.6300	4.8000	3.3325	1.5449	46.359
NOx (grams/mi)	4	1.8700	2.7000	2.1900	0.35805	16.349
Fuel Economy (mpg)	4	9.3000	10.700	10.075	0.57951	5.752

Table D30

Acceleration Cycles, with Dynamomter Roll Coupler Installed

Volvo GL

Acceleration from 0 to 30 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	0.84000	0.96000	0.90000	0.084853	9.428
CO (grams/mi)	2	5.3300	7.5200	6.4250	1.5486	24.103
NOx (grams/mi)	2	4.5400	4.9600	4.7500	0.29698	6.252
Fuel Economy (mpg)	2	4.0000	4.6000	4.3000	0.42426	9.867

Acceleration from 0 to 60 mph at WOT

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	0.72000	0.99000	0.85500	0.19092	22.330
CO (grams/mi)	2	8.4200	12.140	10.280	2.6304	25.588
NOx (grams/mi)	2	4.7100	4.7800	4.7450	0.049497	1.043
Fuel Economy (mpg)	2	6.1000	6.6000	6.3500	0.35355	5.568

Acceleration from 0 to 30 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	0.56000	1.0100	0.78500	0.31820	40.535
CO (grams/mi)	2	3.6800	24.050	13.865	14.404	103.887
NOx (grams/mi)	2	5.0400	8.1000	6.5700	2.1637	32.933
Fuel Economy (mpg)	2	5.2000	5.2000	5.2000	0.0	0.0

Acceleration from 0 to 30 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	1.3600	1.6400	1.5000	0.19799	13.199
CO (grams/mi)	2	25.050	25.220	25.135	0.12021	0.478
NOx (grams/mi)	2	4.6400	8.8900	6.7650	3.0052	44.423
Fuel Economy (mpg)	2	3.6000	3.8000	3.7000	0.14142	3.822

Acceleration from 0 to 30 mph at 5 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	0.94000	2.2600	1.6000	0.93338	58.336
CO (grams/mi)	2	5.7400	40.780	23.260	24.777	106.522
NOx (grams/mi)	2	4.6600	10.500	7.5800	4.1295	54.479
Fuel Economy (mpg)	2	2.8000	3.1000	2.9500	0.21213	7.191

Acceleration from 0 to 30 mph at 6 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	1.4200	2.5100	1.9650	0.77075	39.224
CO (grams/mi)	2	19.370	38.990	29.180	13.873	47.543
NOx (grams/mi)	2	6.8500	10.310	8.5800	2.4466	28.515
Fuel Economy (mpg)	2	2.9000	3.8000	3.3500	0.63640	18.997

Acceleration from 30 to 60 mph at 3 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	0.51000	0.52000	0.51500	0.0070711	1.373
CO (grams/mi)	2	5.2300	5.2400	5.2350	0.0070711	0.135
NOx (grams/mi)	2	2.1500	2.8500	2.5000	0.49497	19.799
Fuel Economy (mpg)	2	8.2000	8.5000	8.3500	0.21213	2.540

Acceleration from 30 to 60 mph at 4 mph per sec

Variable	N	Minimum	Maximum	Mean	Std Dev	C.O.V.
HC (grams/mi)	2	0.38000	0.39000	0.38500	0.0070711	1.837
CO (grams/mi)	2	2.6800	3.5300	3.1050	0.60104	19.357
NOx (grams/mi)	2	1.6600	1.7300	1.6950	0.049497	2.920
Fuel Economy (mpg)	2	10.600	10.700	10.650	0.070711	0.664

Appendix E

Ambient Test Conditions

Table E1

Ambient Test Conditions

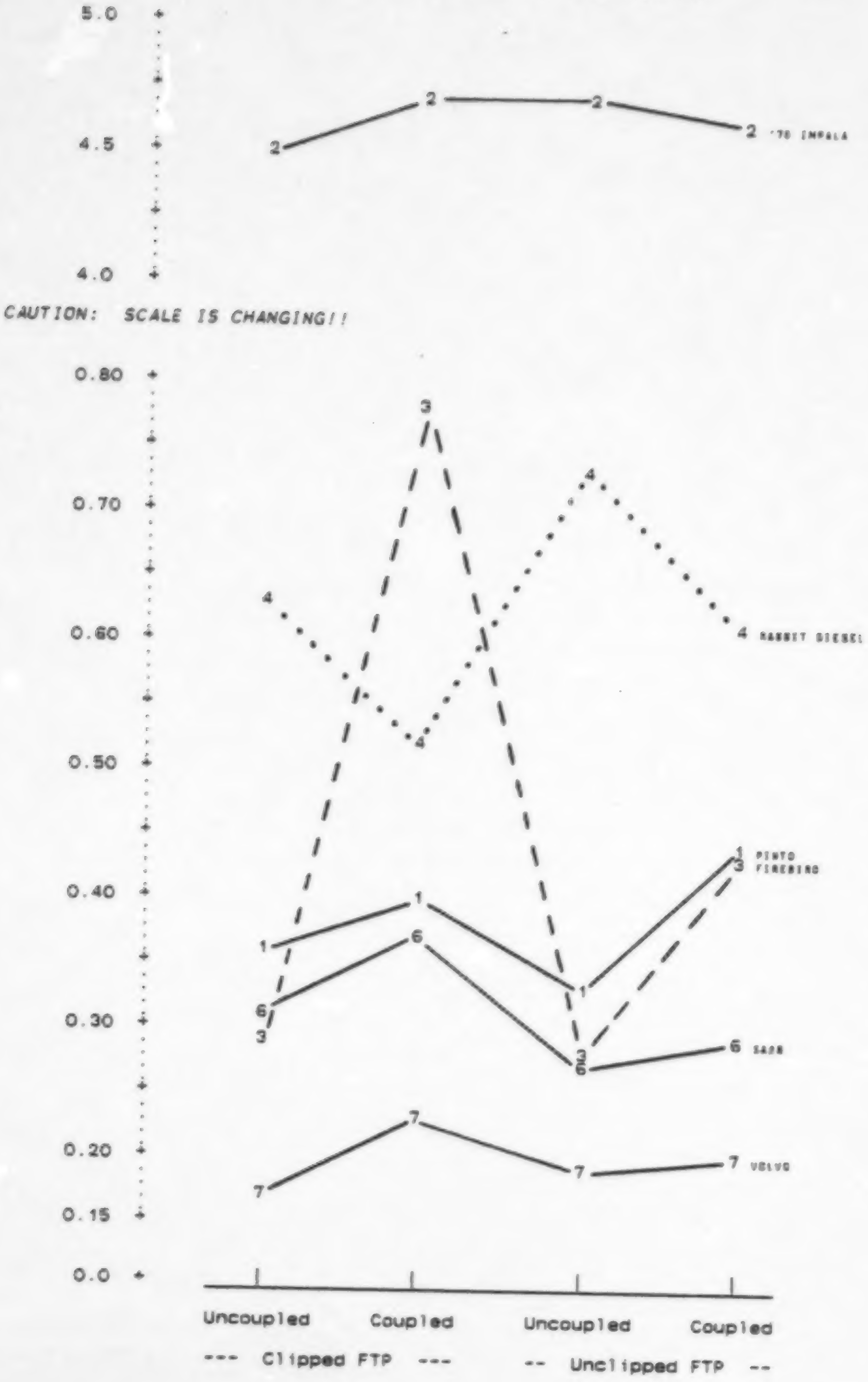
Vehicle	TEST#	DYNO CLPD	TEMP(DRY) (° F)	TEMP(WET) (° F)	HUMIDITY (%)	BAROM (in)	ODOMETER (miles)
Pinto	1	YES	66	62	77	29.63	5169
	2	YES	70	62	70	29.59	5216
	3	YES	69	62	72	29.61	5292
	4	YES	68	64	83	29.63	5337
	5	YES	62	52	42	29.64	5410
	6	NO	72	58	49	29.77	5450
	7	NO	66	54	42	29.95	5482
	8	NO	68	50	24	29.97	5506
	9	NO	68	50	24	29.84	5538
Impala	0	YES	74	65	78	29.60	85859
	1	YES	68	62	74	29.60	85900
	2	YES	70	62	70	29.57	86072
	3	YES	67	62	75	29.61	86088
	4	YES	68	64	83	29.61	86122
	5	YES	72	58	49	29.59	86189
	6	NO	77	58	41	29.77	86373
	7	NO	74	52	21	29.95	86449
	8	NO	70	50	20	29.97	86479
	9	NO	78	54	23	29.72	86491
Firebird	1	NO	72	60	58	29.69	16404
	2	NO	68	54	39	29.85	16478
	3	NO	73	53	27	30.00	16501
	4	NO	70	50	21	29.87	16512
	5	YES	70	55	40	29.76	16608
	6	YES	70	60	61	29.73	16620
	7	YES	74	60	54	29.82	16682
	8	YES	74	54	29	29.96	16712
Rabbit	1	NO	62	52	41	29.83	14581
	2	NO	68	58	55	29.77	14617
	3	NO	68	54	39	29.80	14548
	4	NO	68	54	39	29.86	14570
	5	YES	68	58	55	29.86	14450
	6	YES	64	56	54	29.86	14461
	7	YES	72	62	66	29.90	14496
	8	YES	70	52	28	29.76	14507
	9	YES	76	58	42	29.75	14529
Saab	1	NO	65	56	52	29.95	7067
	2	NO	75	58	44	29.82	7109
	3	NO	66	56	51	29.60	7172
	4	NO	63	52	40	29.60	7183
	5	YES	66	52	35	29.72	7201
	6	YES	70	52	28	29.63	7214
	7	YES	64	56	54	29.57	7249
	8	YES	64	56	55	29.24	7291
Volvo	1	NO	70	59	56	29.93	17923
	2	NO	66	56	50	29.78	17969
	3	NO	68	58	55	29.82	17980
	4	NO	72	58	49	29.63	17994
	5	YES	64	54	46	29.56	18169
	6	YES	66	56	51	29.64	18182
	7	YES	64	56	55	29.26	18193
	8	YES	62	54	49	29.60	18204

Appendix F-1

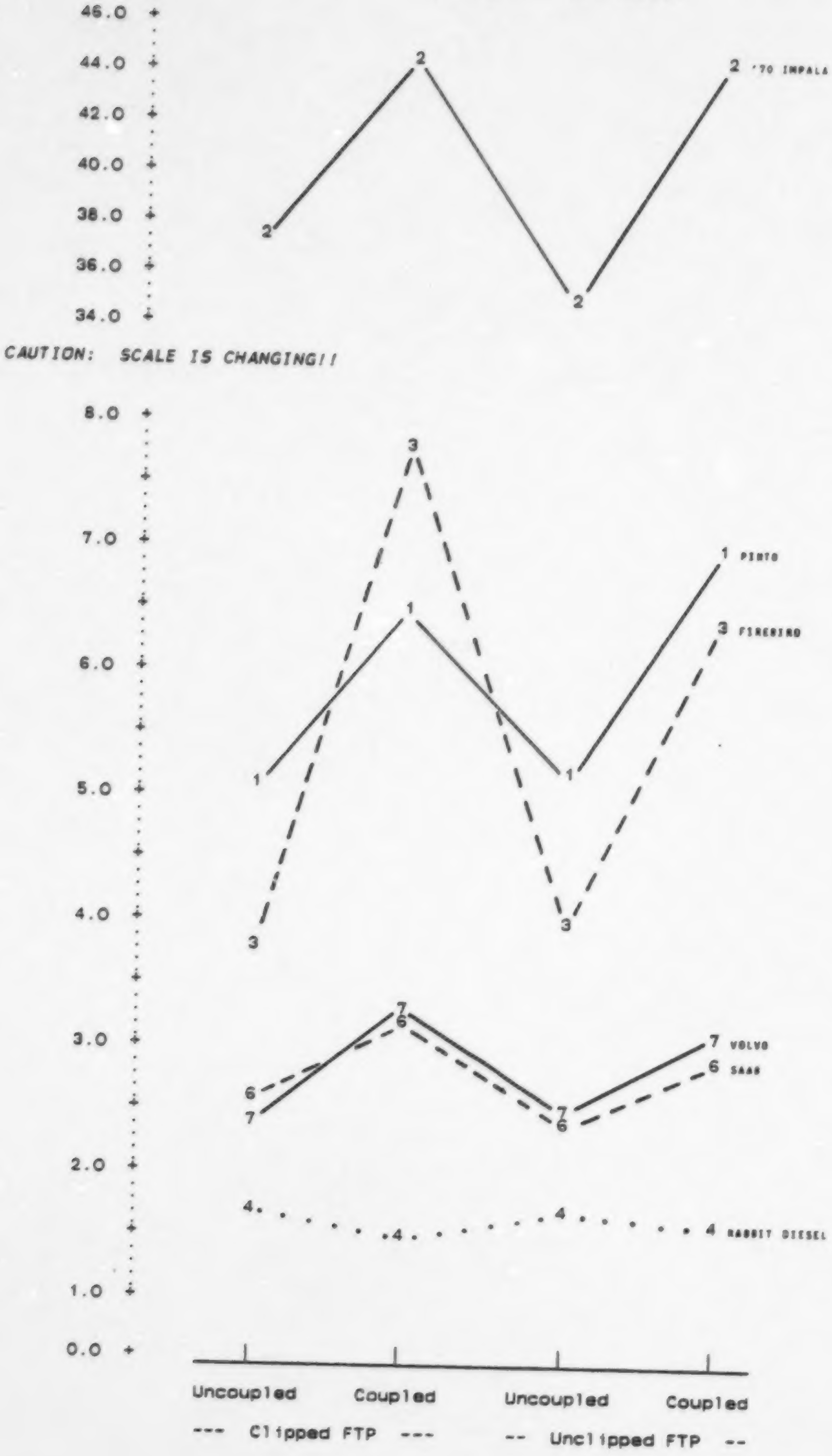
Comparisons among the vehicles of Emissions and Fuel Economy During FTP Cycles.

(These graphs are based on data in Tables D1 through D6 of Appendix D.)

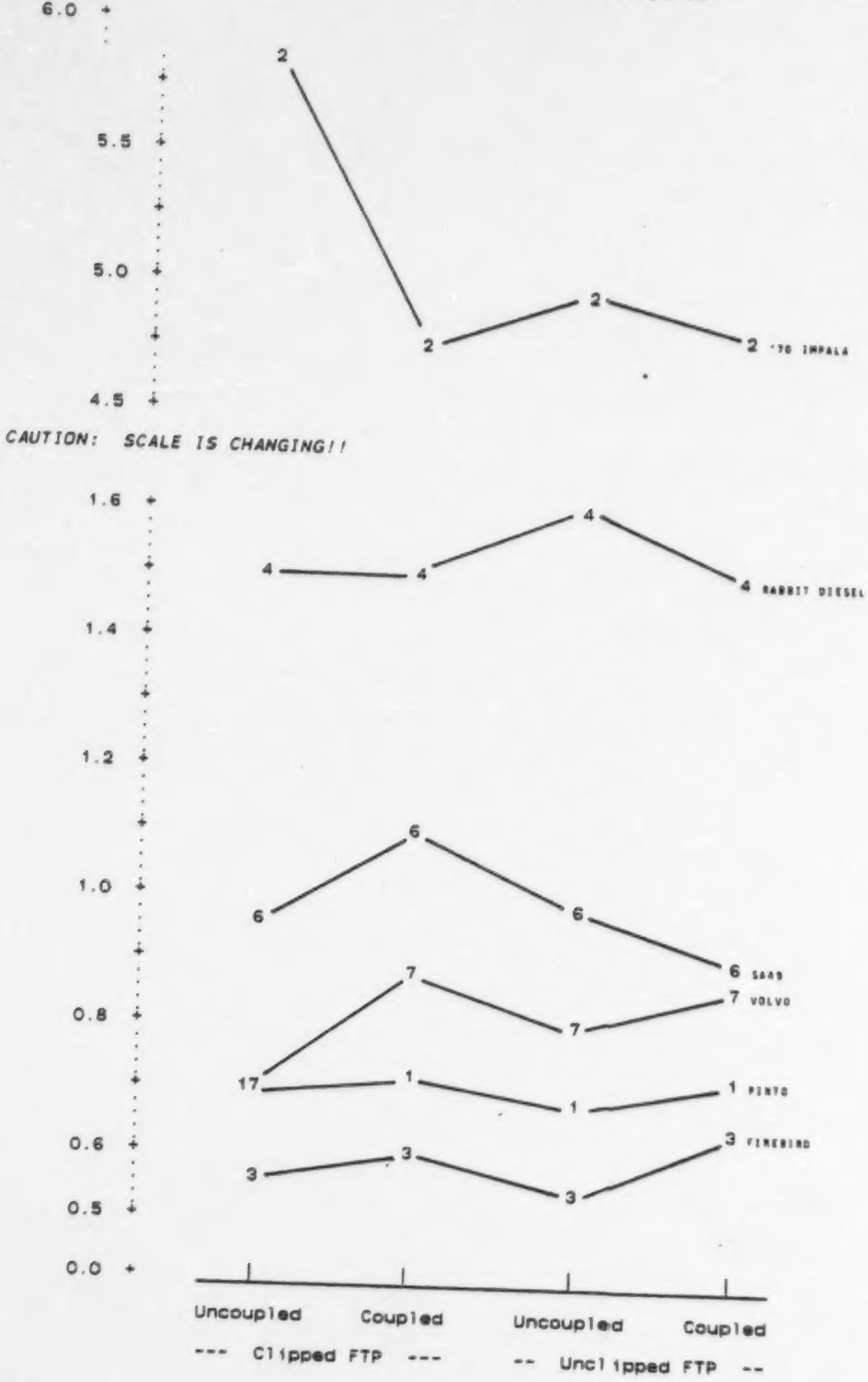
Comparison of HC Emissions (grams per mile)
During FTP Test Cycles



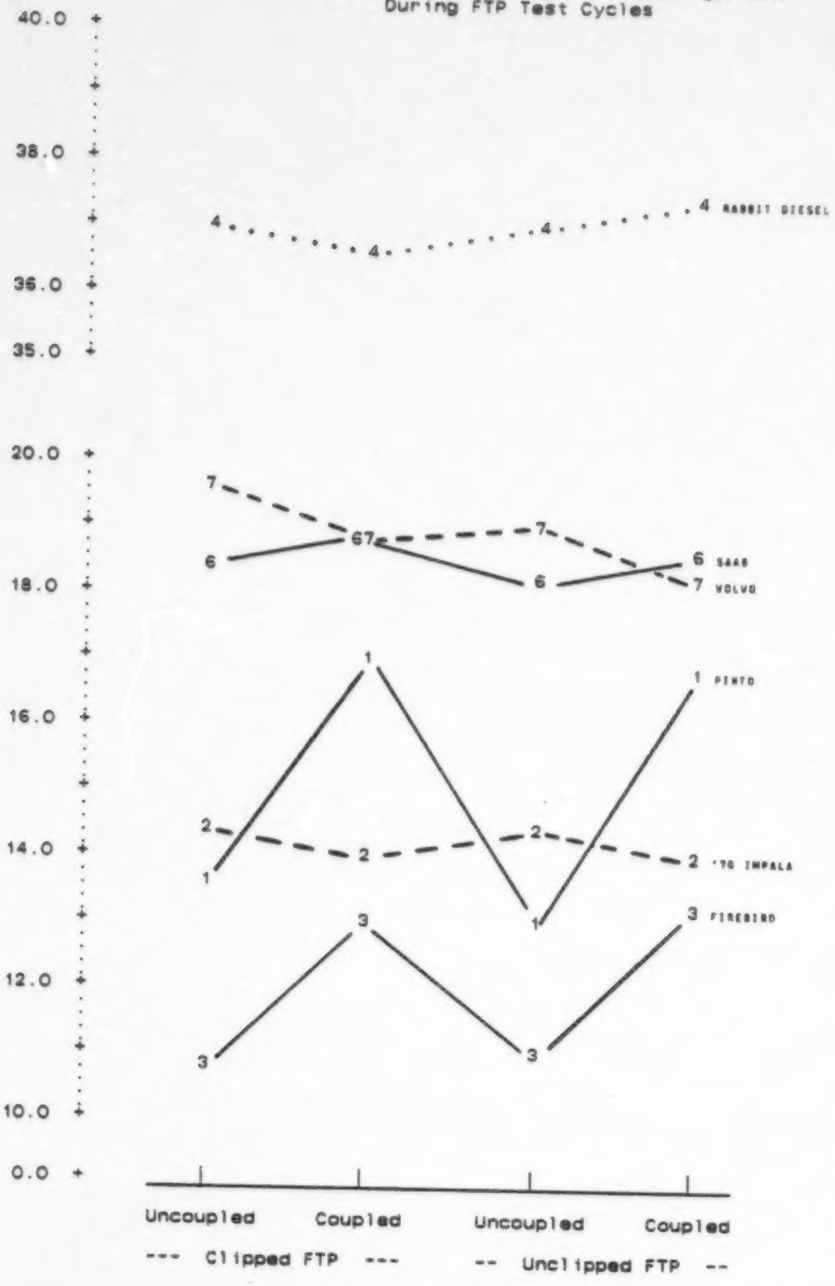
Comparison of CO Emissions (grams per mile)
During FTP Test Cycles



Comparison of NOx Emissions (grams per mile)
During FTP Test Cycles



Comparison of Fuel Economy (miles per gallon)
During FTP Test Cycles



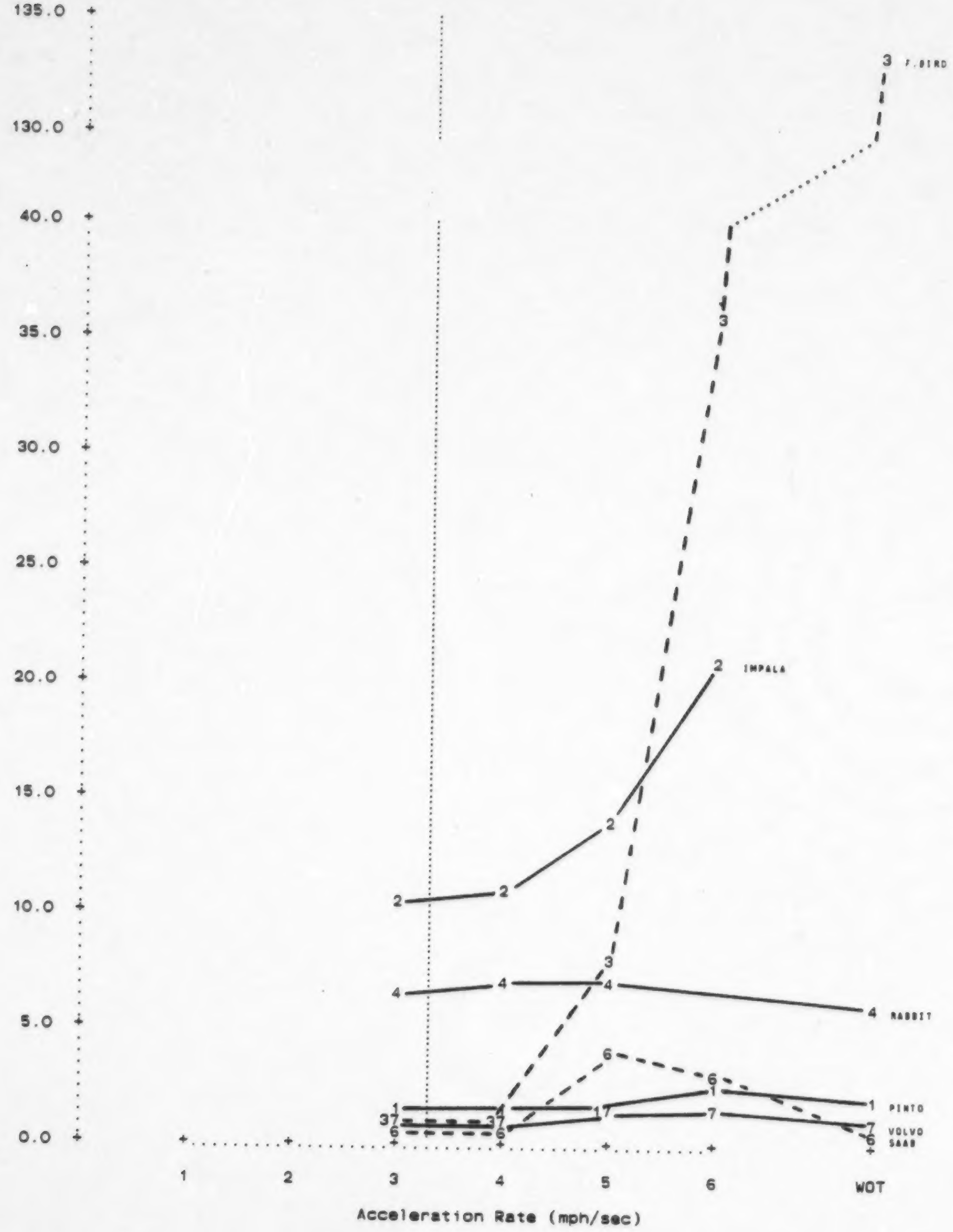
Appendix F-2

Comparisons Among the Test Vehicles of Emissions (grams per mile) During the Acceleration Cycles.

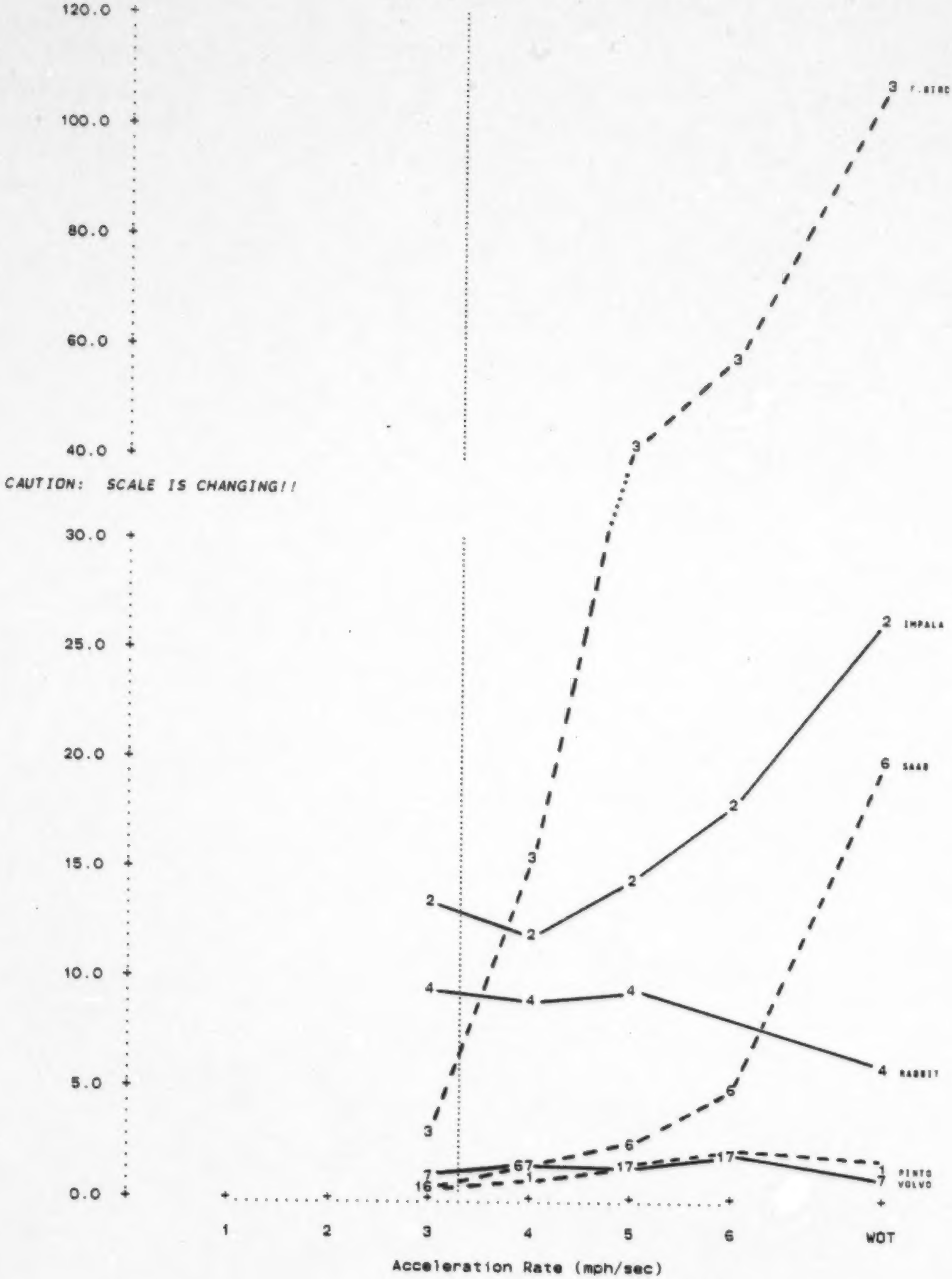
(These graphs are based on data in Tables D19 through D30 from Appendix D.)

The dotted line indicates the rate (3.3 mph/sec) at which the accelerations were "clipped" to create the standard FTP.

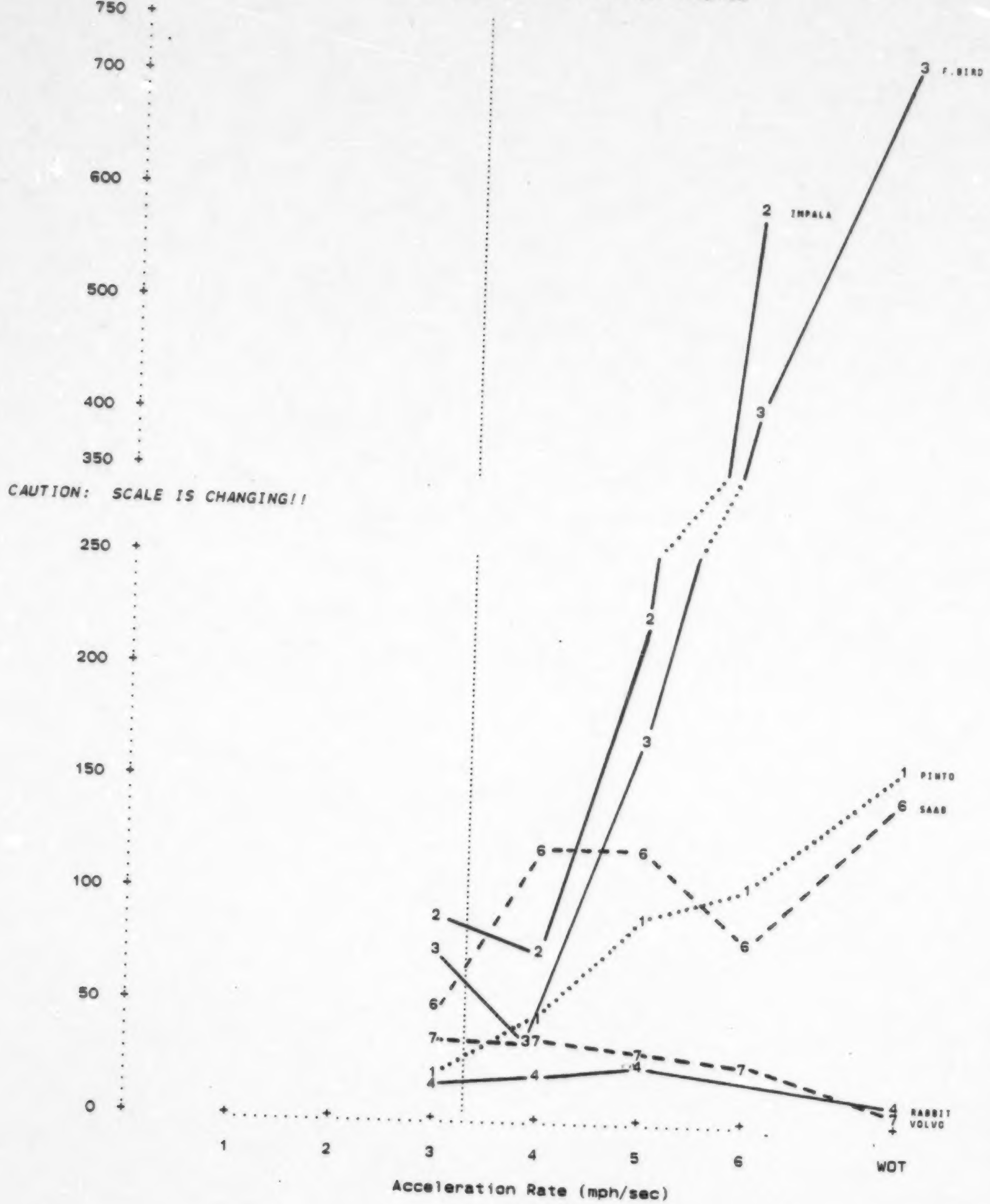
Comparison of HC Emissions (grams per mile)
During Accelerations from 0 to 30 MPH
With Dynamometer Rollers **not** Coupled



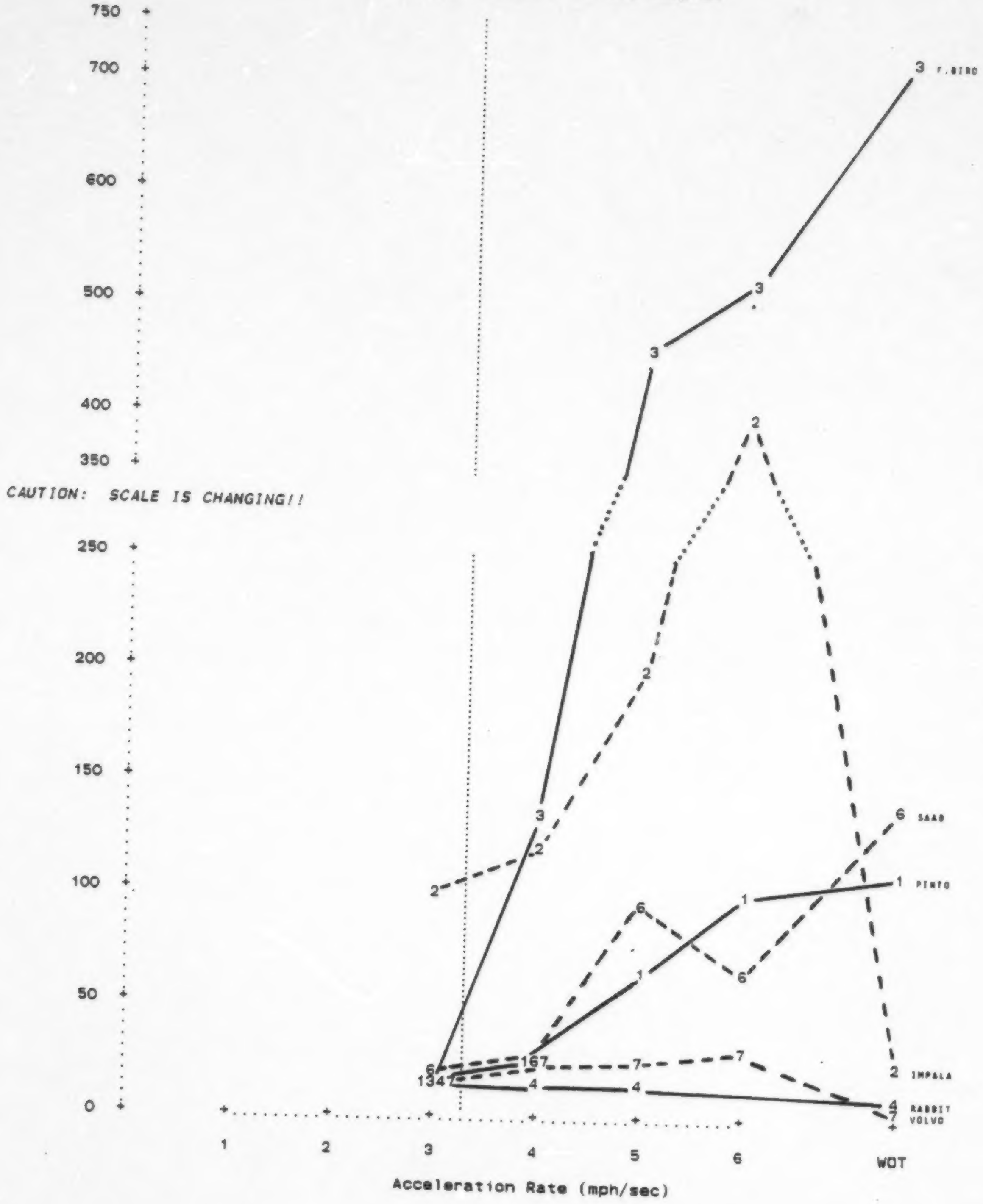
Comparison of HC Emissions (grams per mile)
During Accelerations from 0 to 30 MPH
With Dynamometer Rollers Coupled



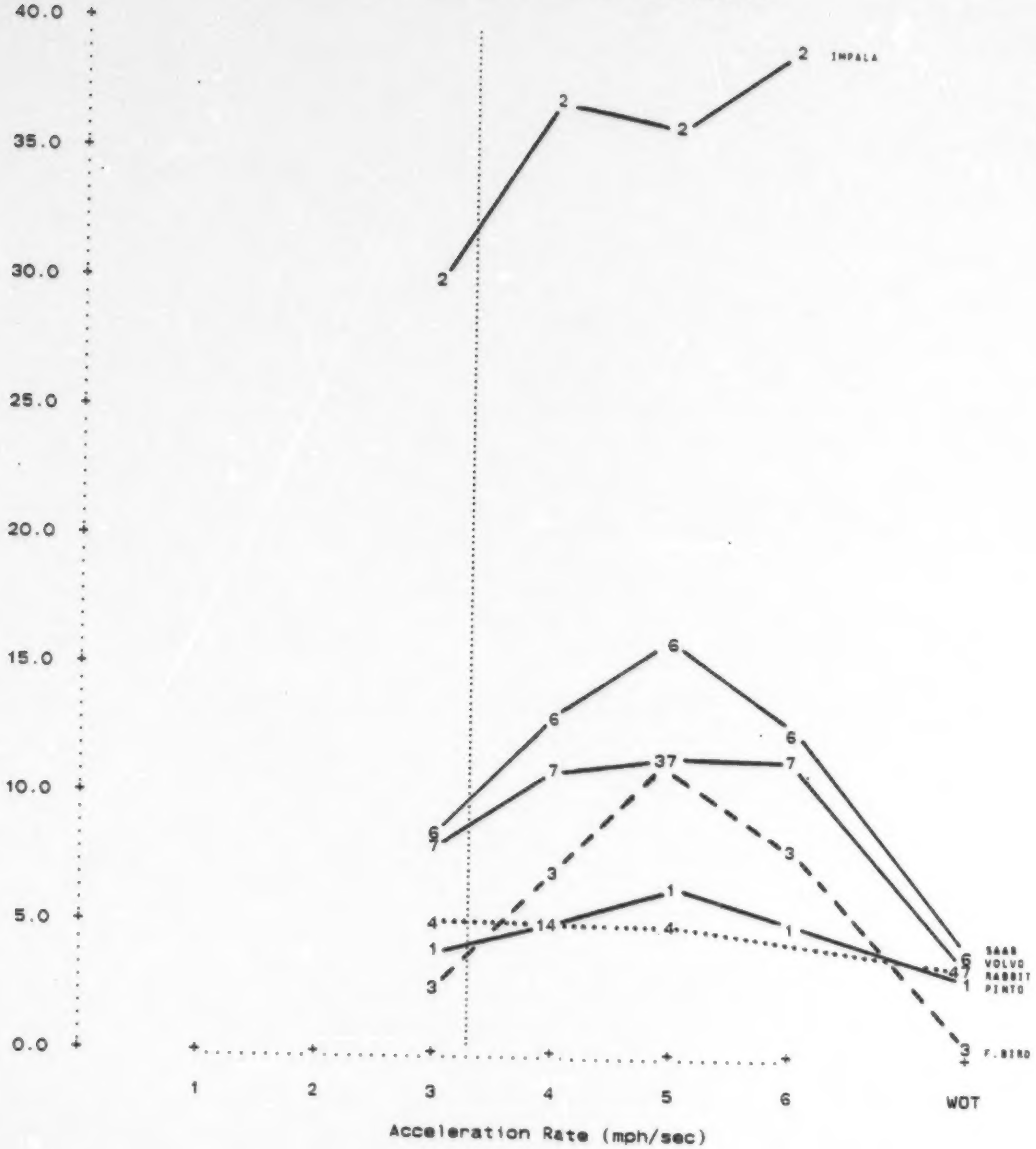
Comparison of CO Emissions (grams per mile)
During Accelerations from 0 to 30 MPH
With Dynamometer Rollers **not** Coupled



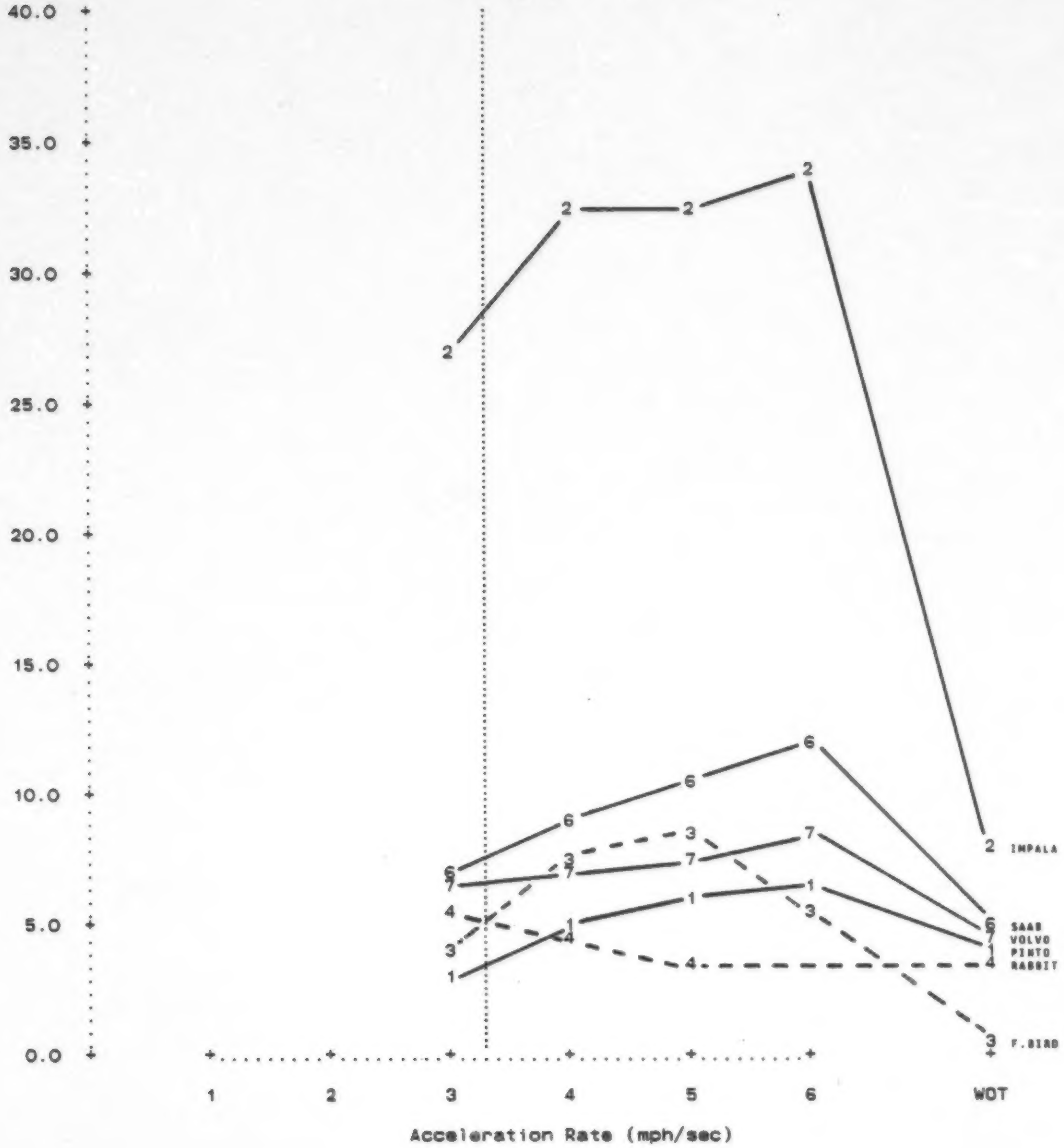
Comparison of CO Emissions (grams per mile)
During Accelerations from 0 to 30 MPH
With Dynamometer Rollers Coupled



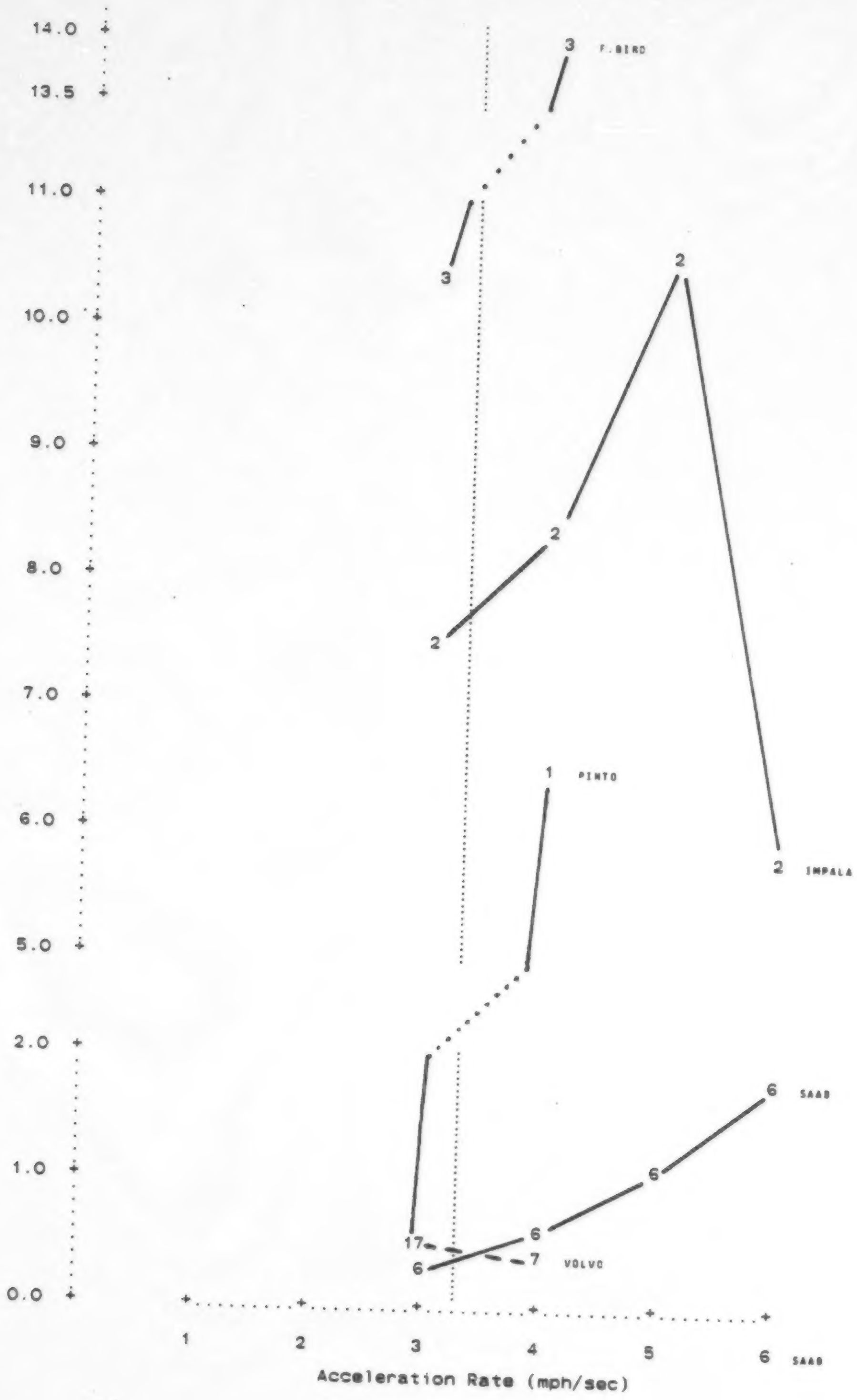
Comparison of NOx Emissions (grams per mile)
During Accelerations from 0 to 30 MPH
With Dynamometer Rollers **not** Coupled



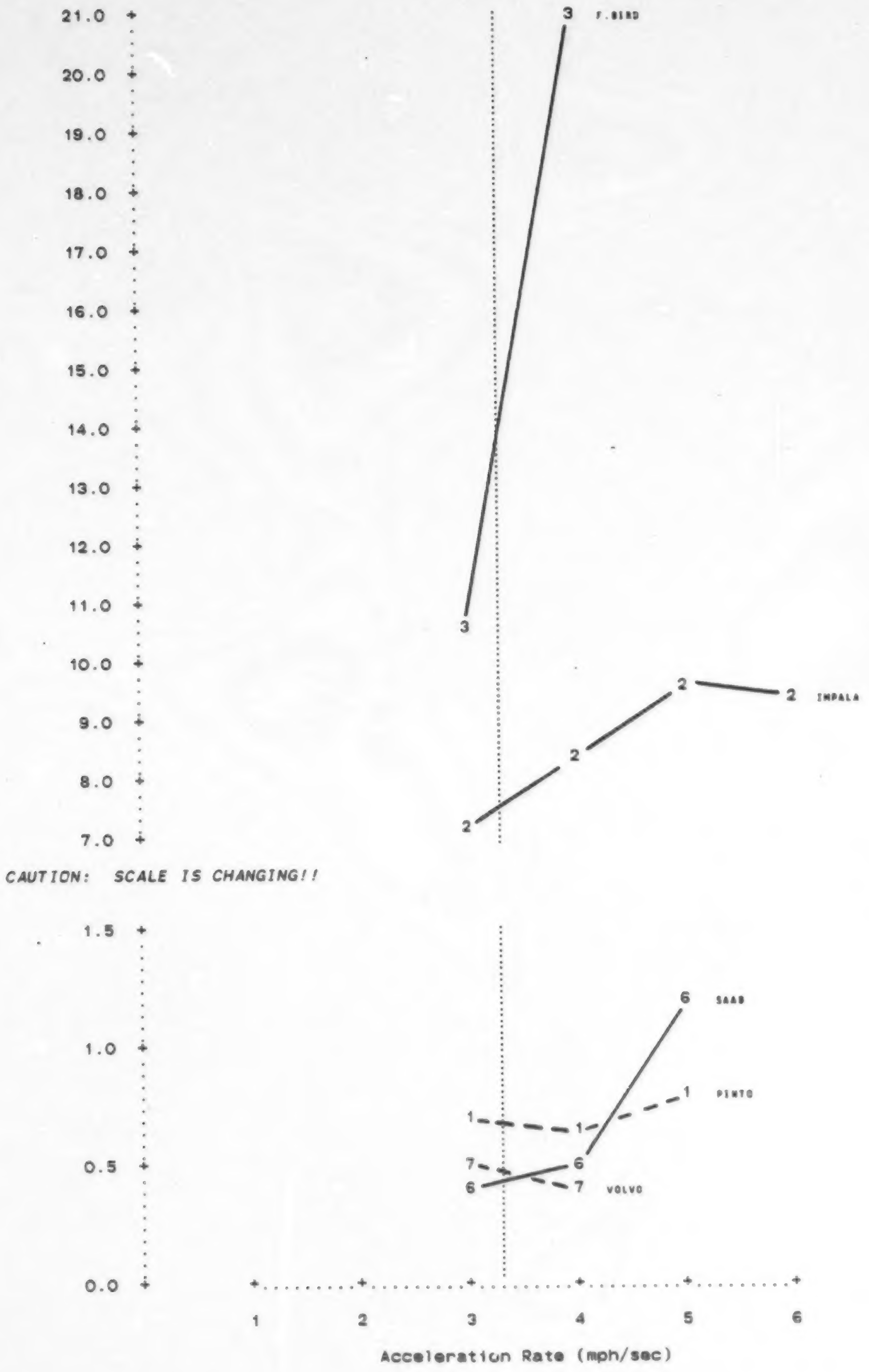
Comparison of NOx Emissions (grams per mile)
During Accelerations from 0 to 30 MPH
With Dynamometer Rollers Coupled



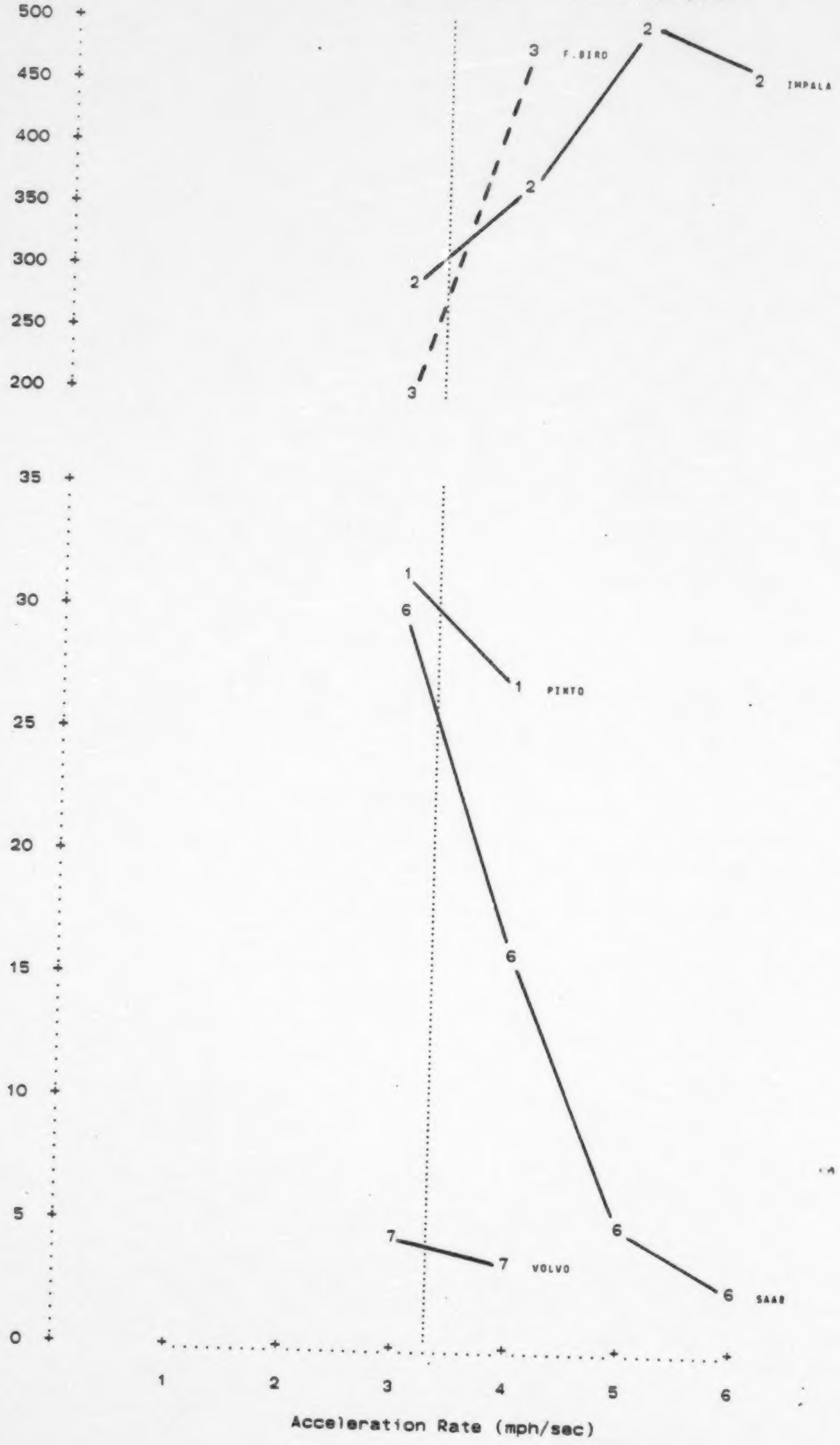
Comparison of HC Emissions (grams per mile)
During Accelerations from 30 to 60 MPH
With Dynamometer Rollers **not** Coupled



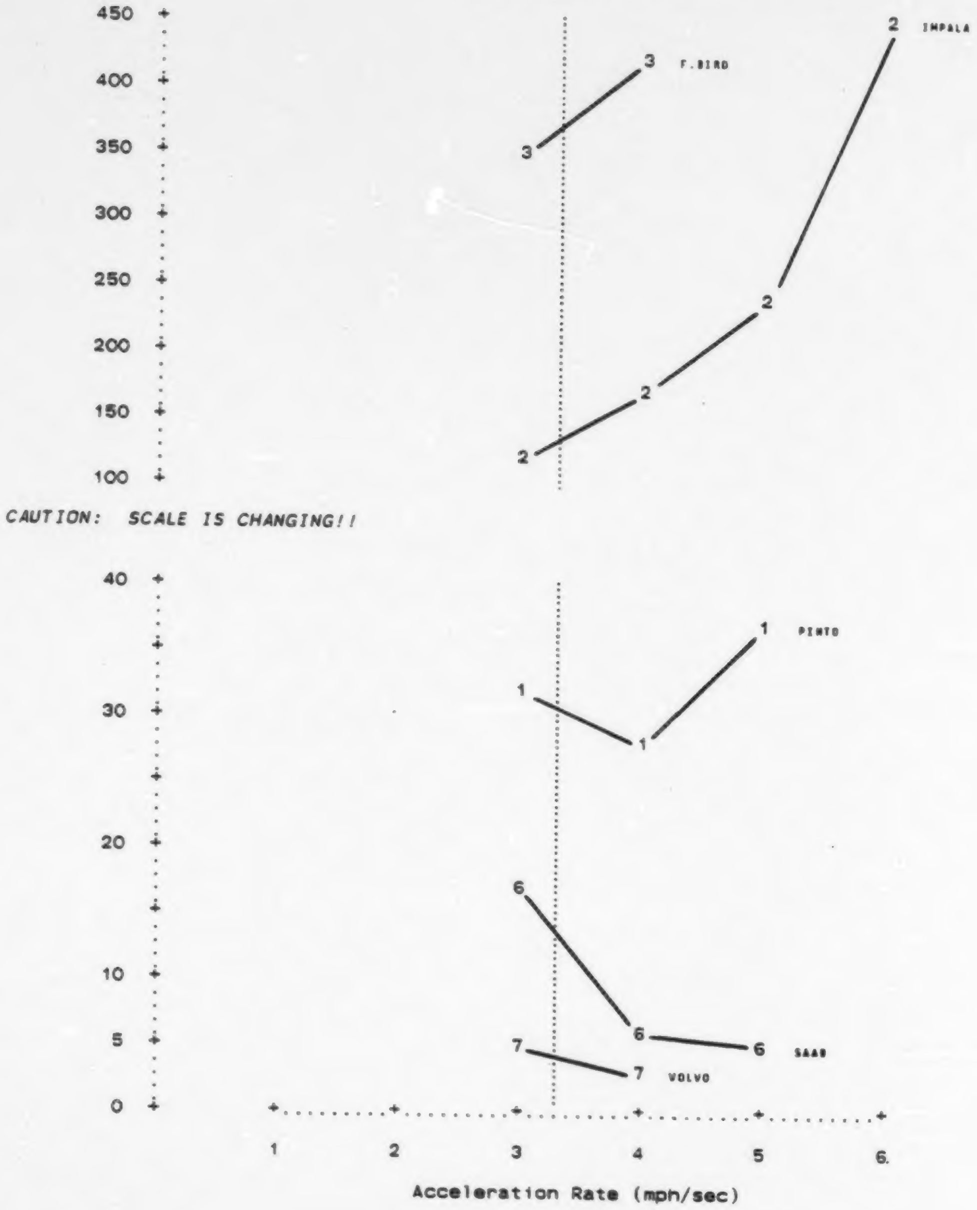
Comparison of HC Emissions (grams per mile)
During Accelerations from 30 to 60 MPH
With Dynamometer Rollers Coupled



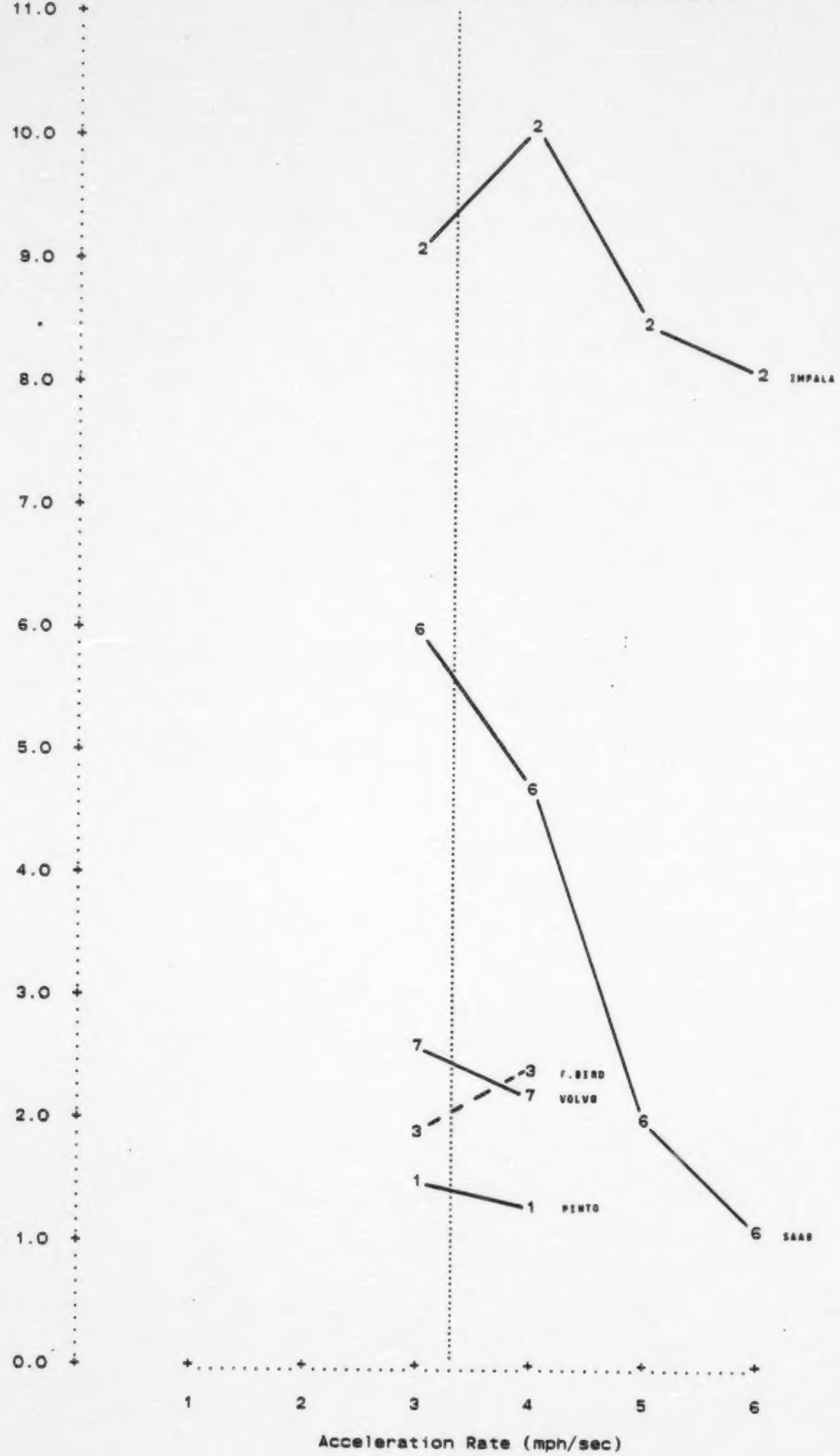
Comparison of CO Emissions (grams per mile)
During Accelerations from 30 to 60 MPH
With Dynamometer Rollers **not** Coupled



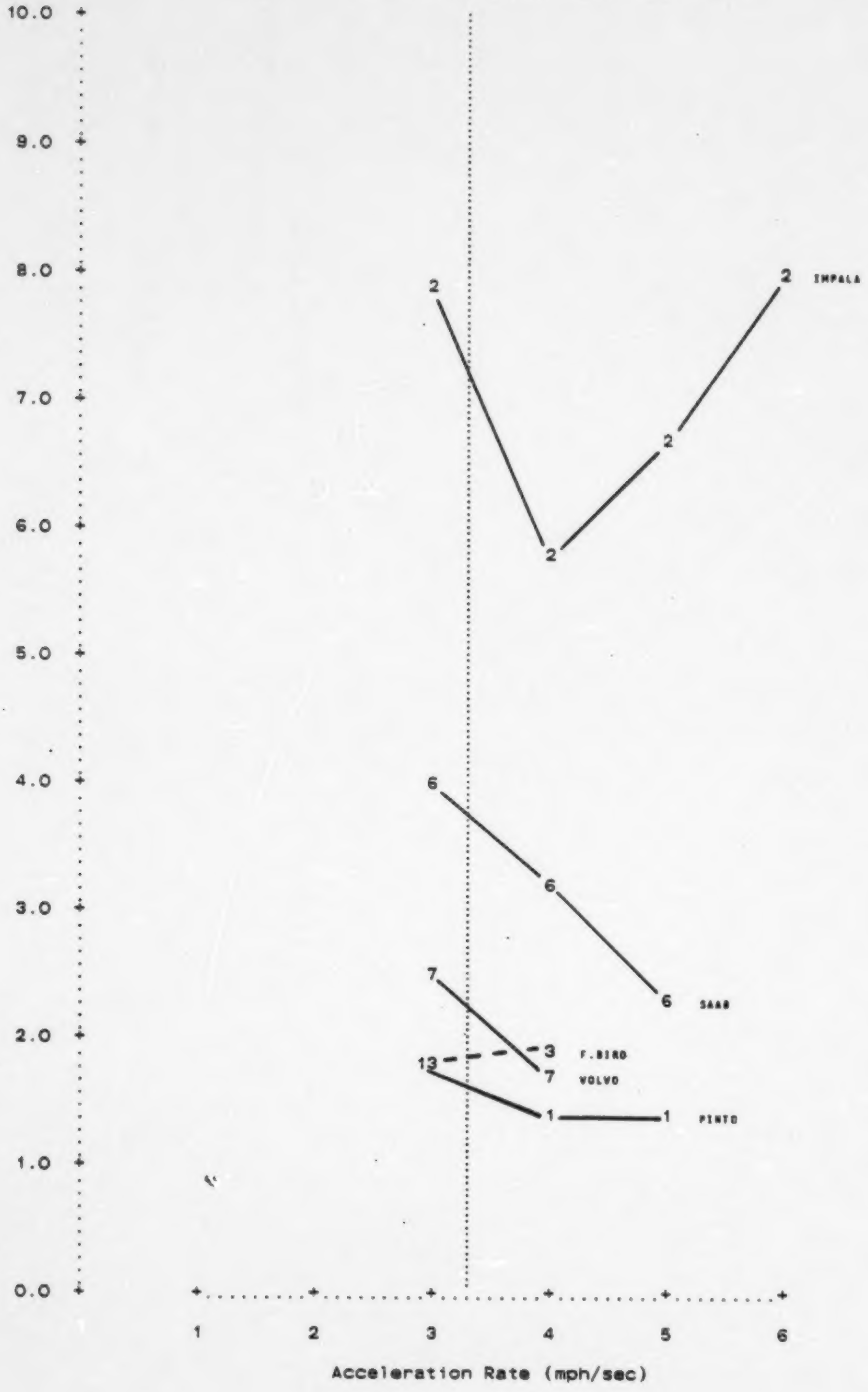
Comparison of CO Emissions (grams per mile)
During Accelerations from 30 to 60 MPH
With Dynamometer Rollers Coupled



Comparison of NOx Emissions (grams per mile)
During Accelerations from 30 to 60 MPH
With Dynamometer Rollers **not** Coupled



Comparison of NOx Emissions (grams per mile)
During Accelerations from 30 to 60 MPH
With Dynamometer Rollers Coupled



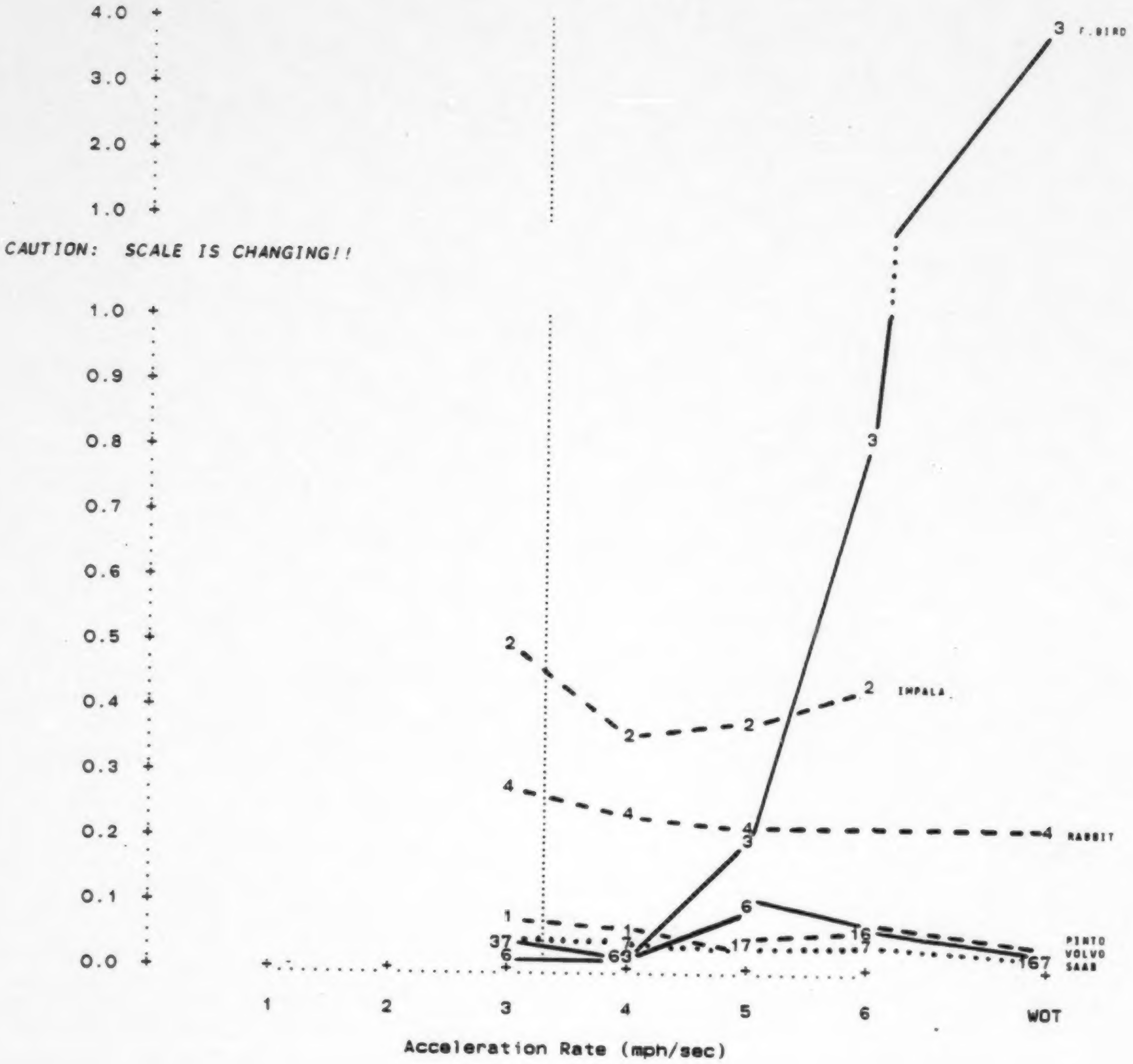
Appendix F-3

Comparisons Among the Test Vehicles of Total Emissions During the Acceleration Cycles.

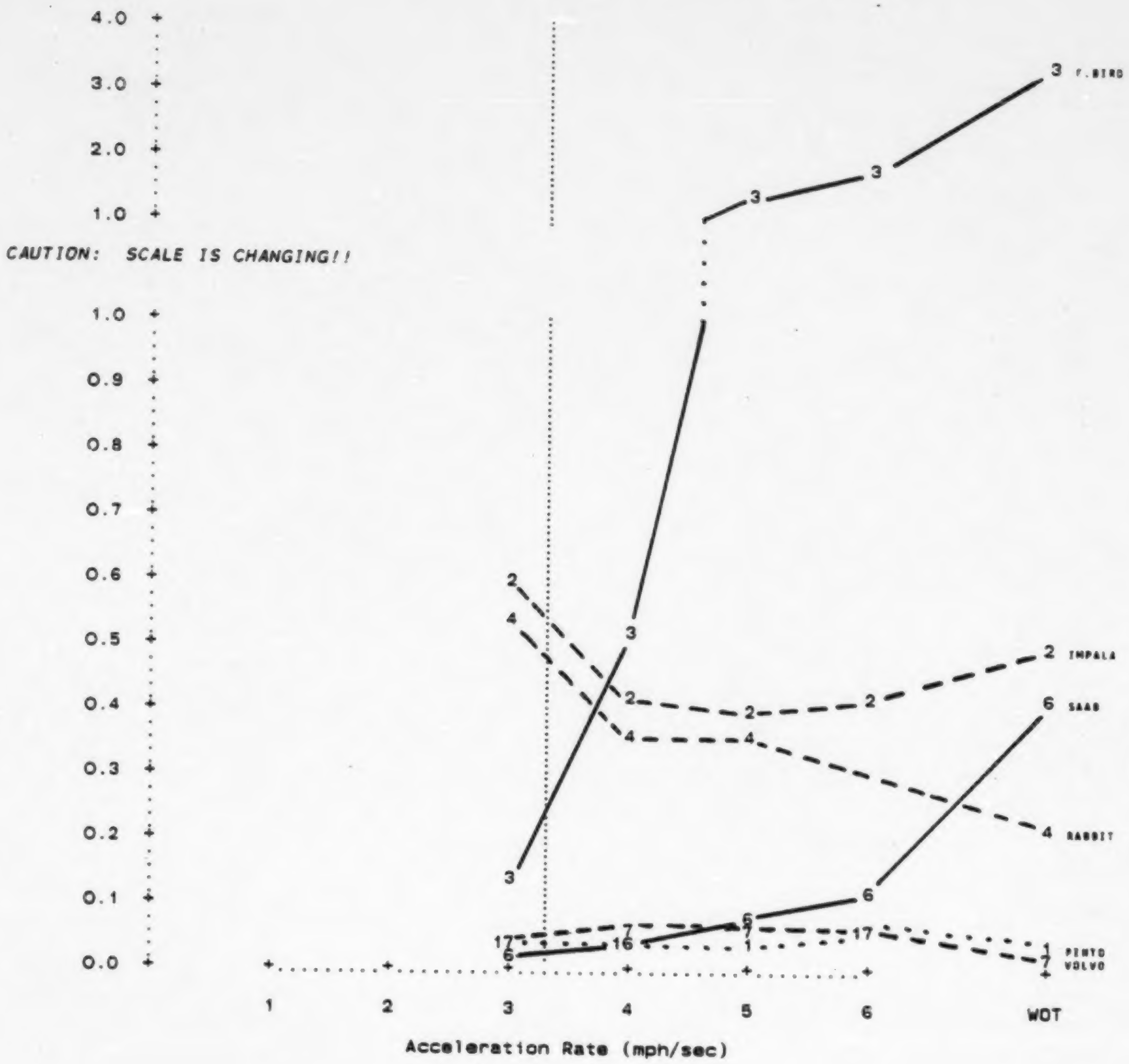
(These graphs are based on data in Tables D7 through D18 from Appendix D.)

The dotted line indicates the rate (3.3 mph/sec) at which the accelerations were "clipped" to create the standard FTP.

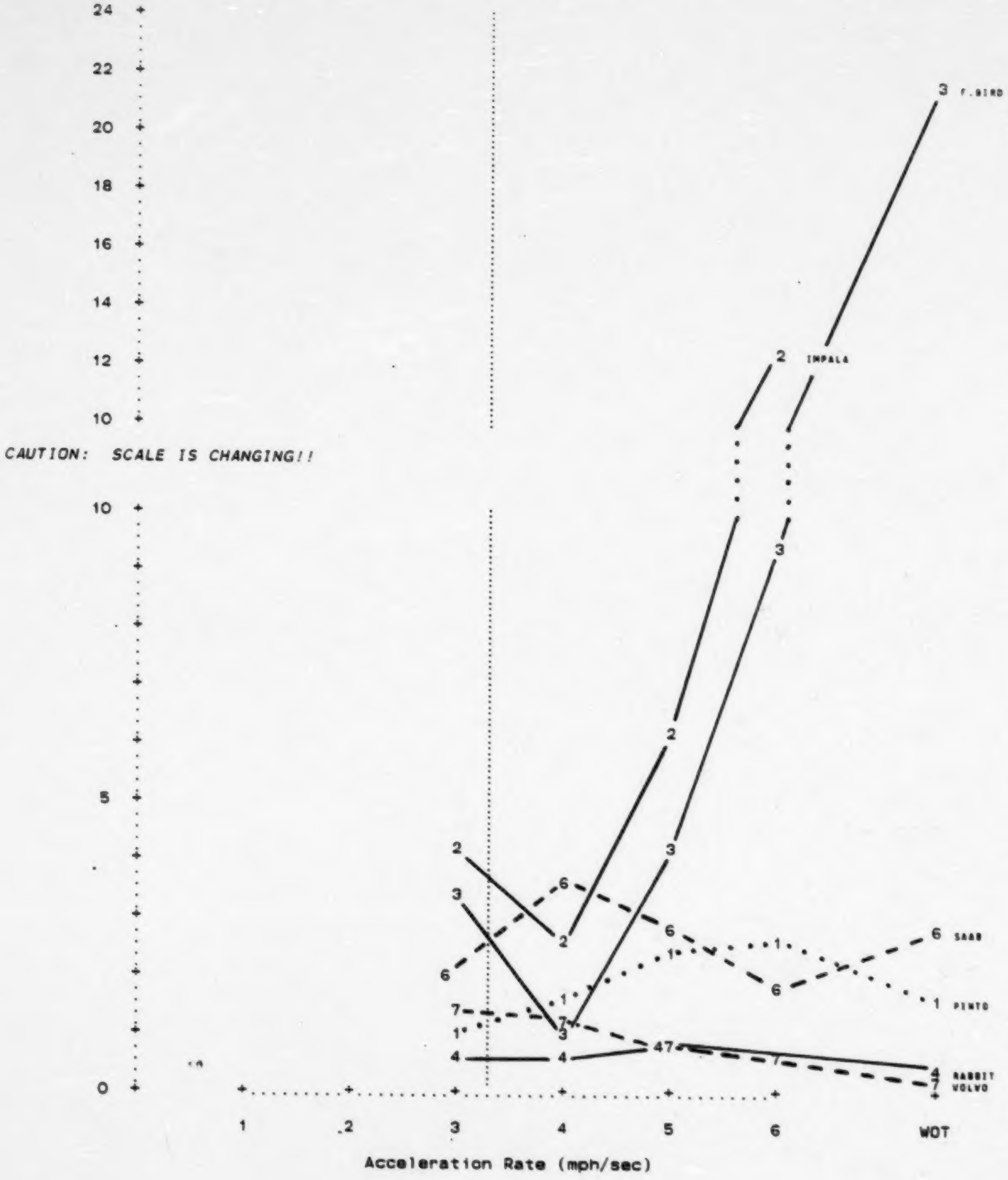
Comparison of Total HC Emissions (grams per maneuver)
During Accelerations from 0 to 30 MPH
With Dynamometer Rollers **not** Coupled



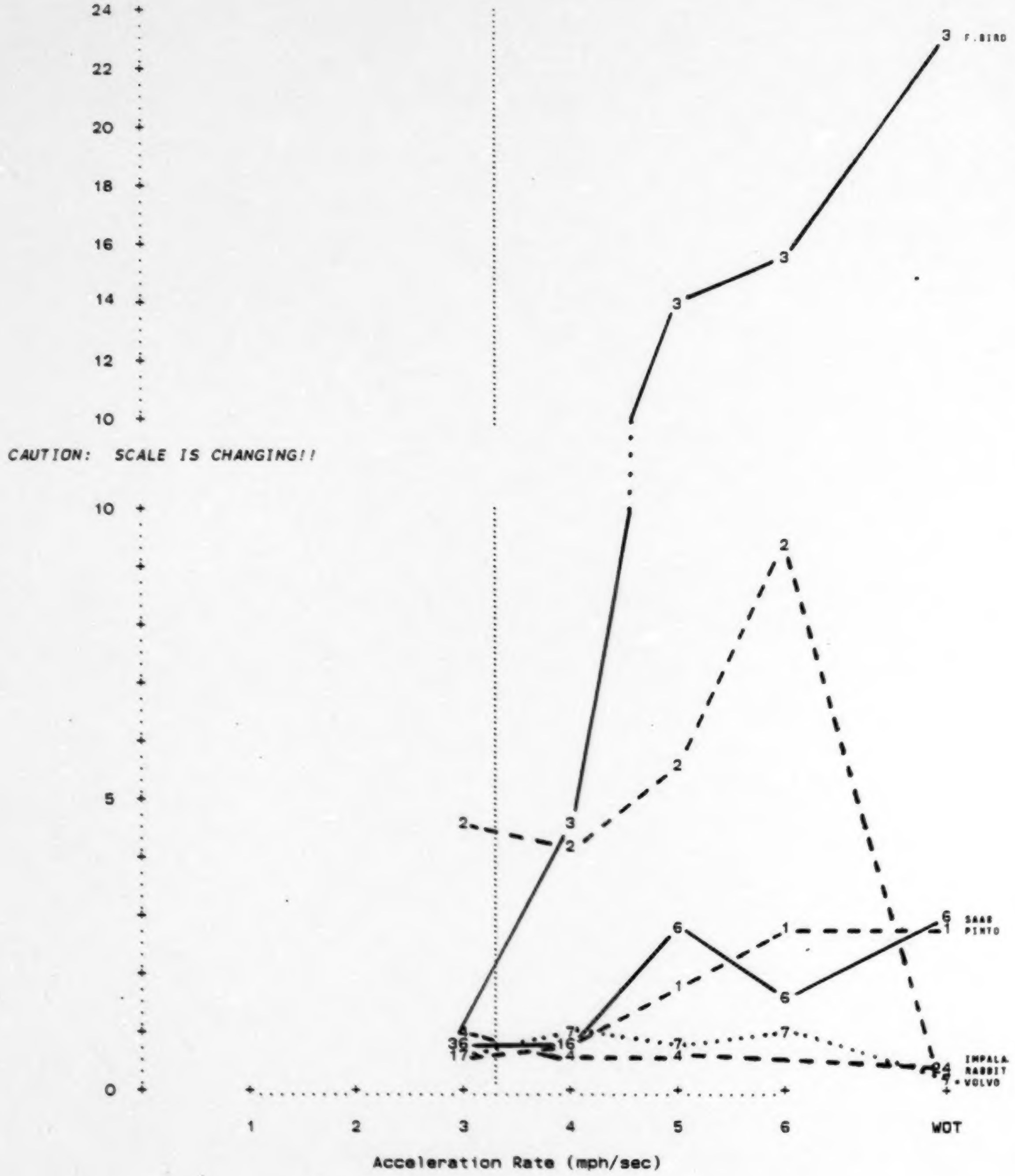
Comparison of Total HC Emissions (grams per maneuver)
During Accelerations from 0 to 30 MPH
With Dynamometer Rollers Coupled



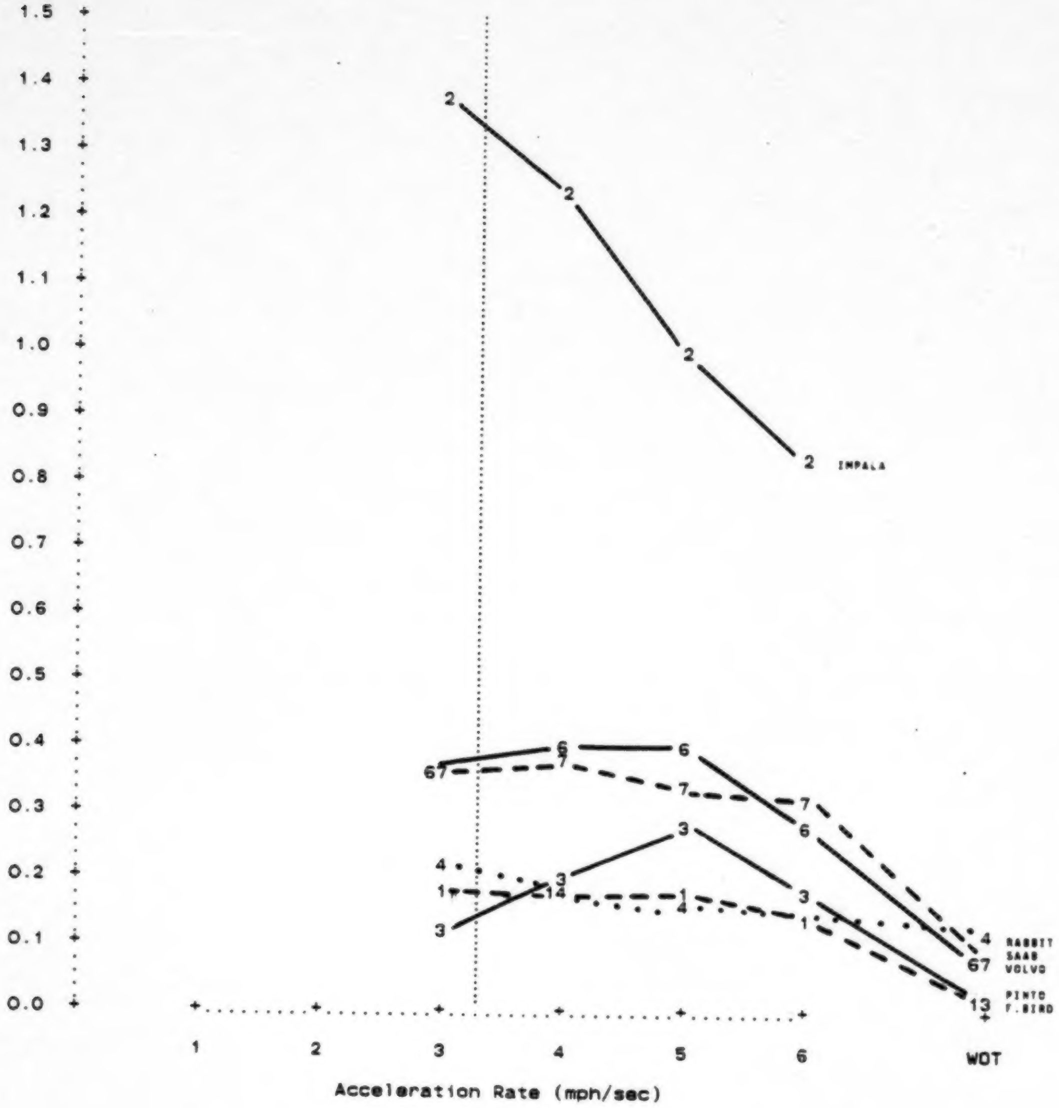
Comparison of Total CO Emissions (grams per maneuver)
During Accelerations from 0 to 30 MPH
With Dynamometer Rollers **not** Coupled



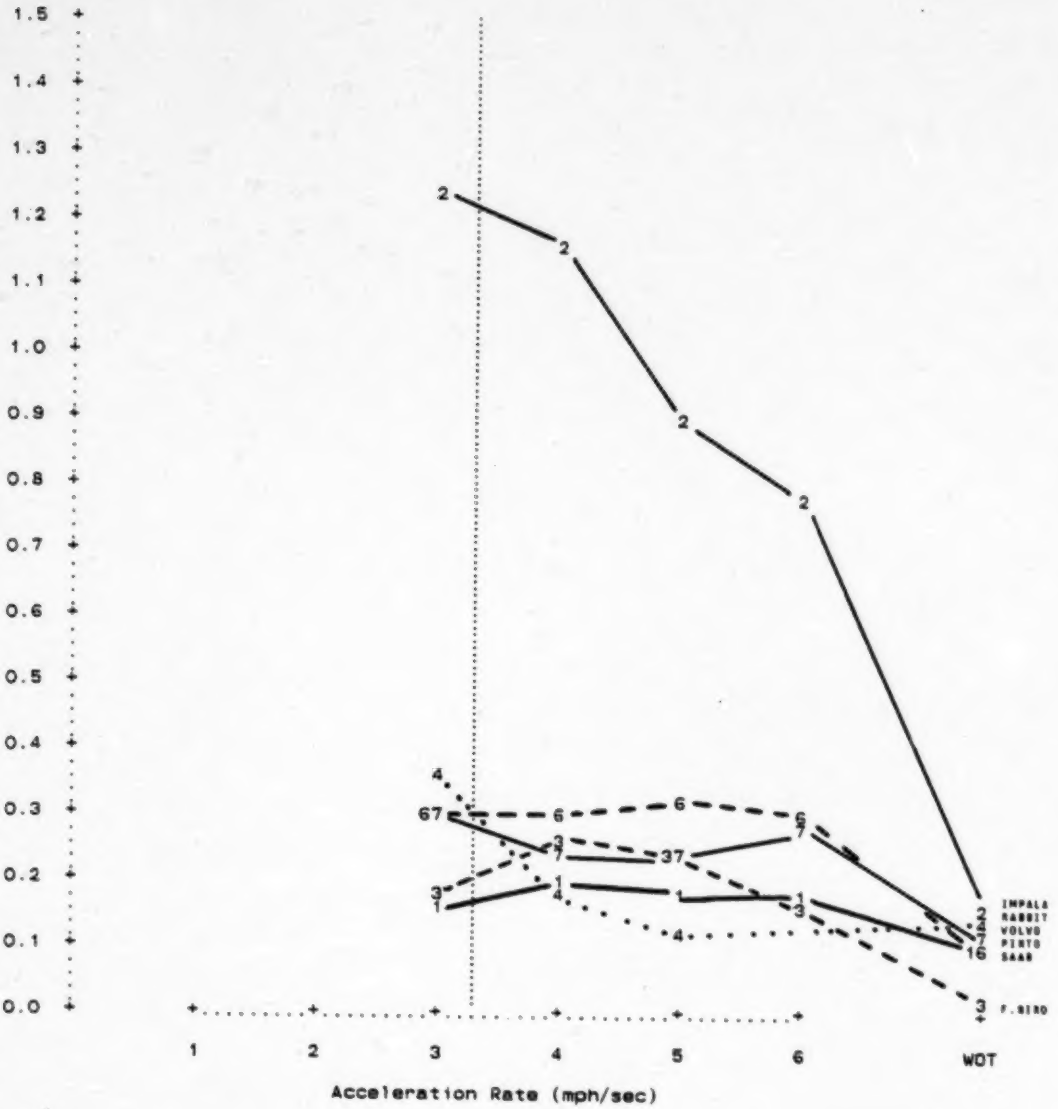
Comparison of Total CO Emissions (grams per maneuver)
During Accelerations from 0 to 30 MPH
With Dynamometer Rollers Coupled



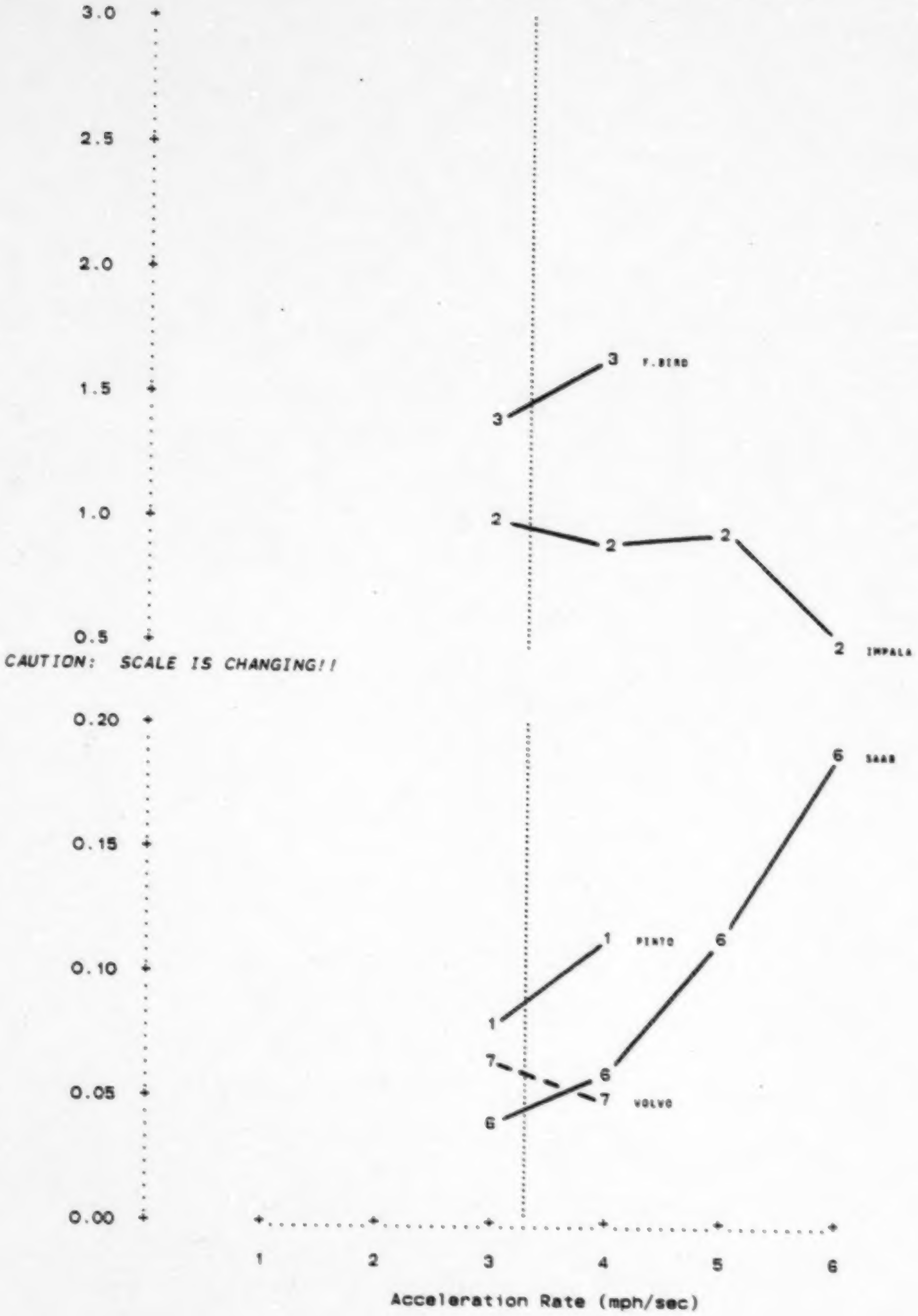
Comparison of Total NOx Emissions (grams per maneuver)
During Accelerations from 0 to 30 MPH
With Dynamometer Rollers **not** Coupled



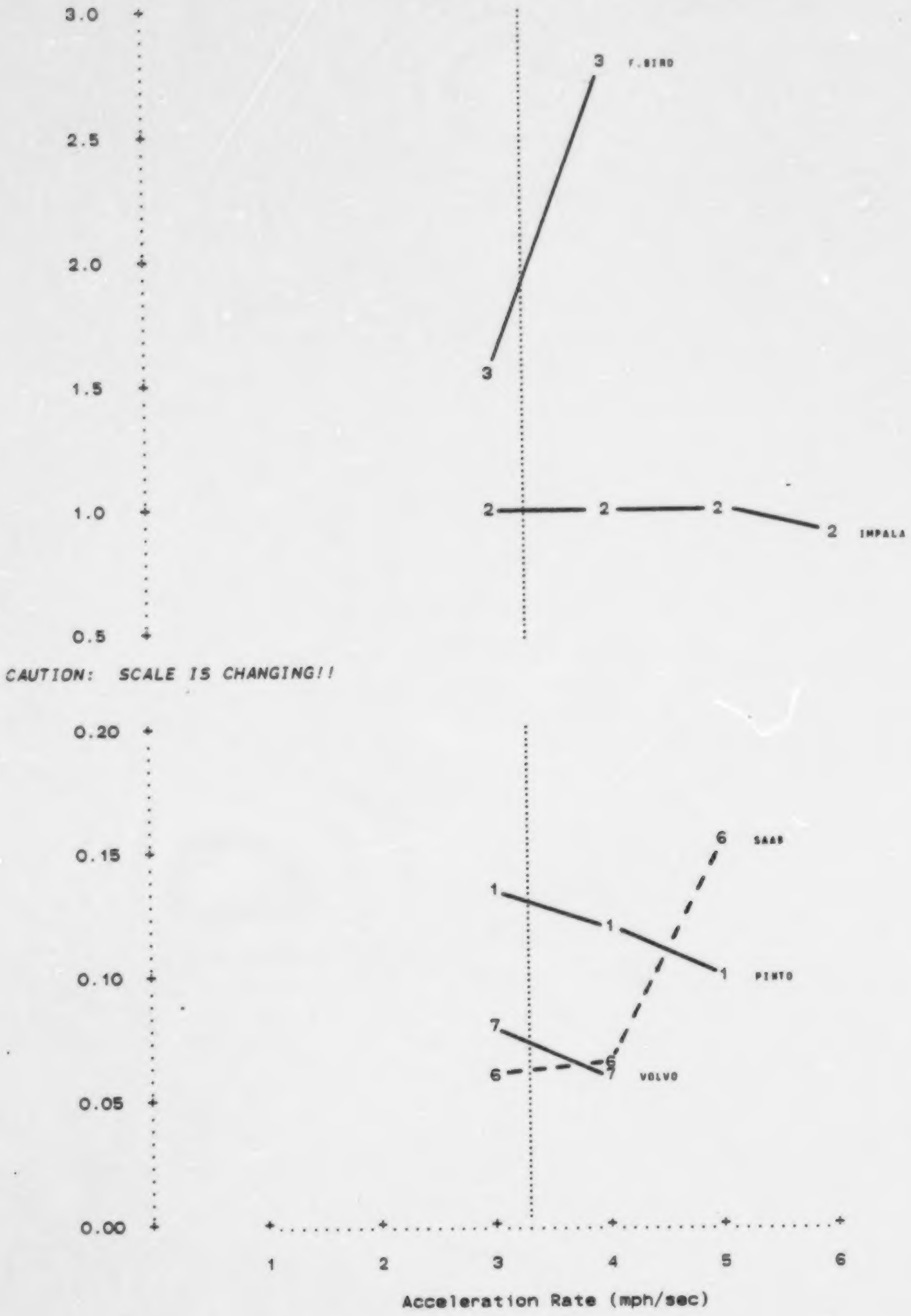
Comparison of Total NOx Emissions (grams per maneuver)
During Accelerations from 0 to 30 MPH
With Dynamometer Rollers Coupled



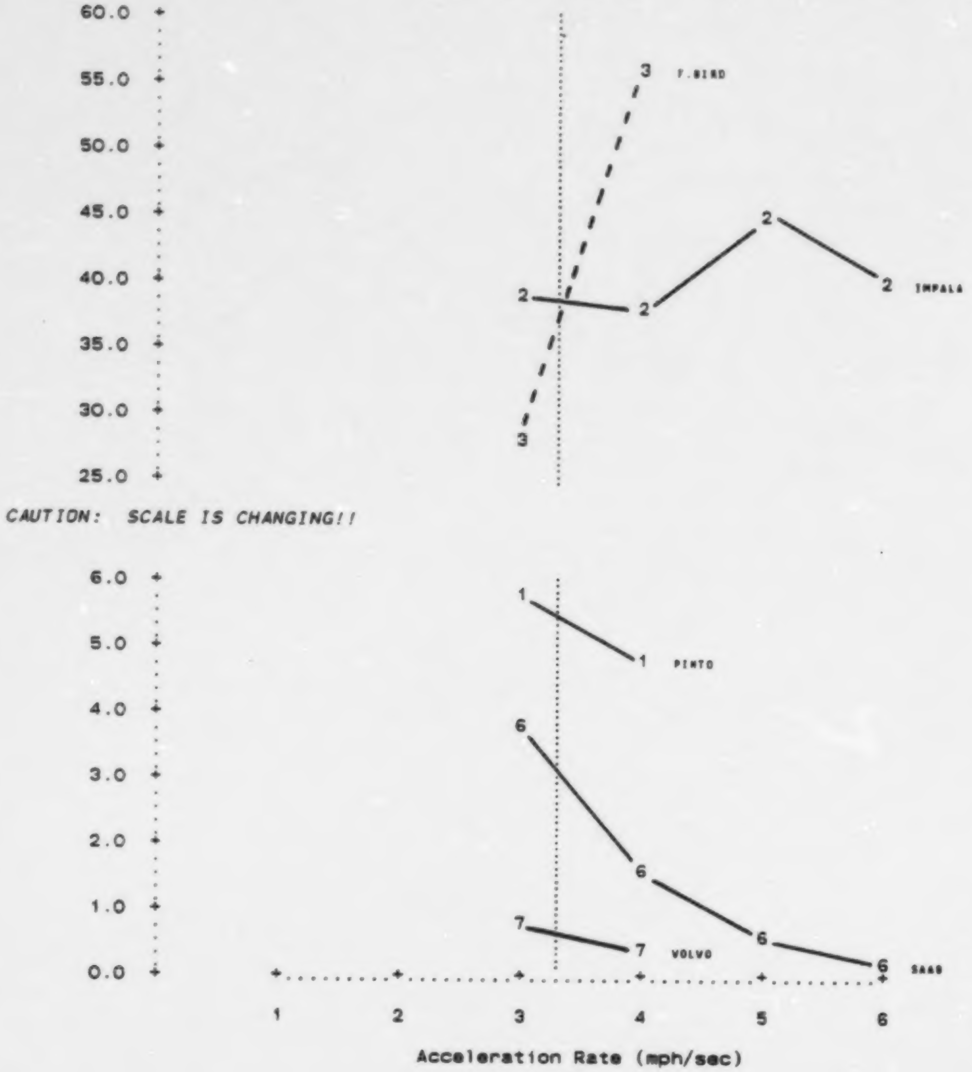
Comparison of Total HC Emissions (grams per maneuver)
During Accelerations from 30 to 60 MPH
With Dynamometer Rollers **not** Coupled

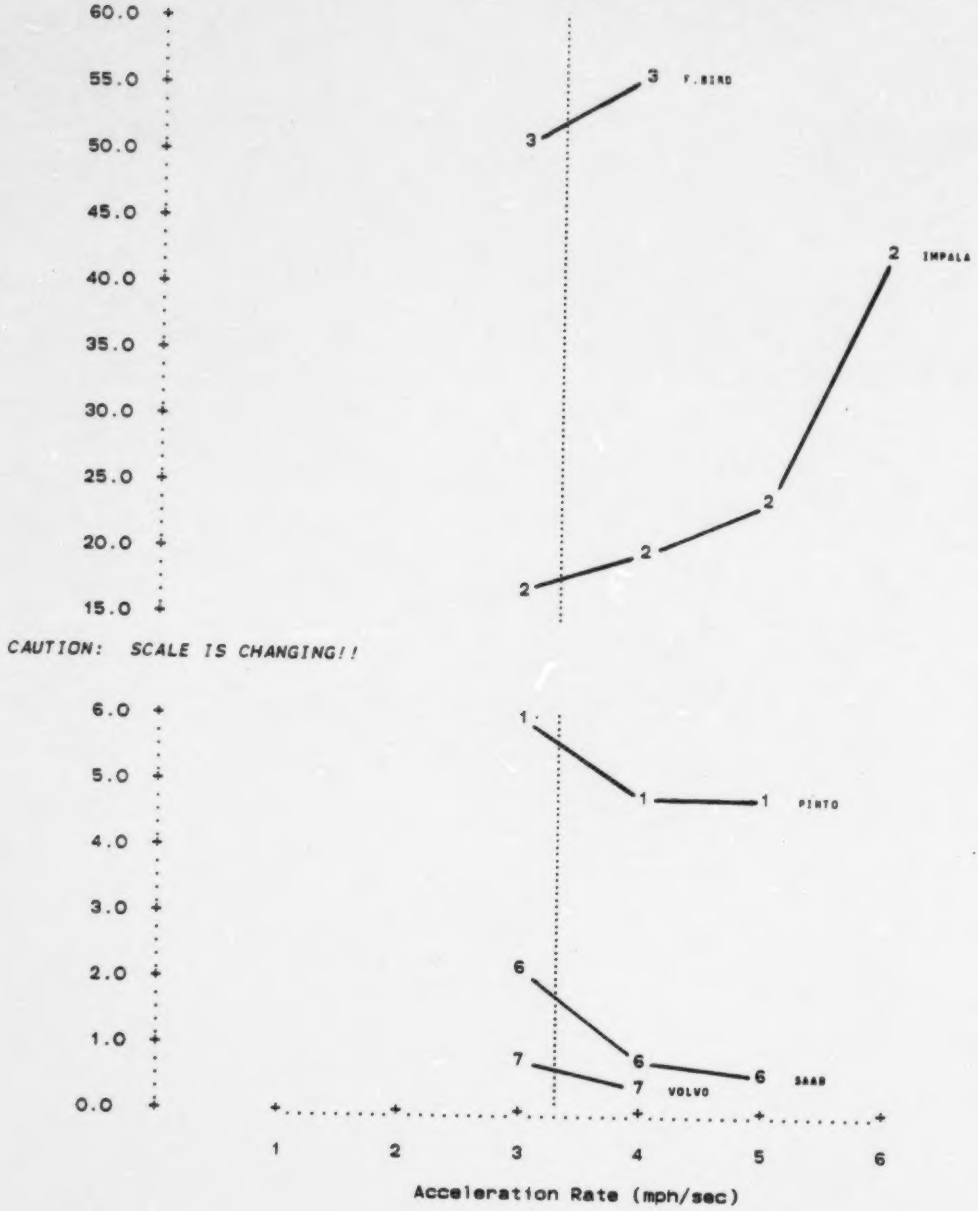


Comparison of Total HC Emissions (grams per maneuver)
During Accelerations from 30 to 60 MPH
With Dynamometer Rollers Coupled



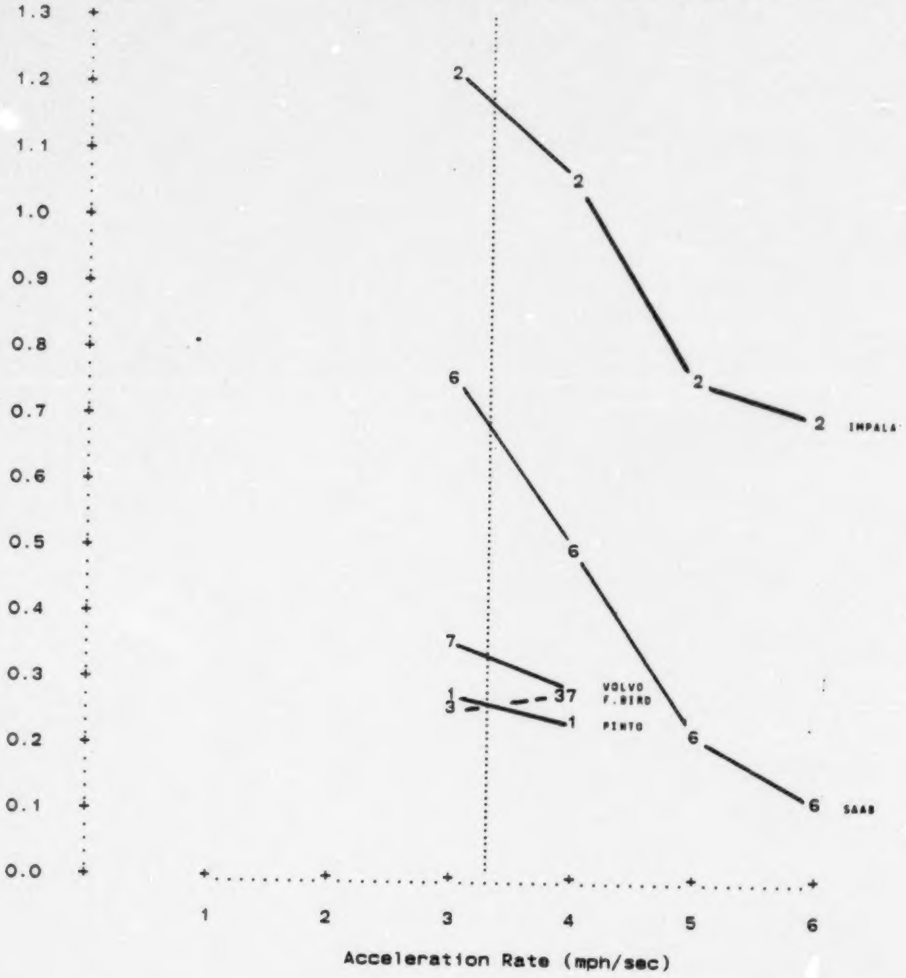
Comparison of Total CO Emissions (grams per maneuver)
During Accelerations from 30 to 60 MPH
With Dynamometer Rollers **not** Coupled

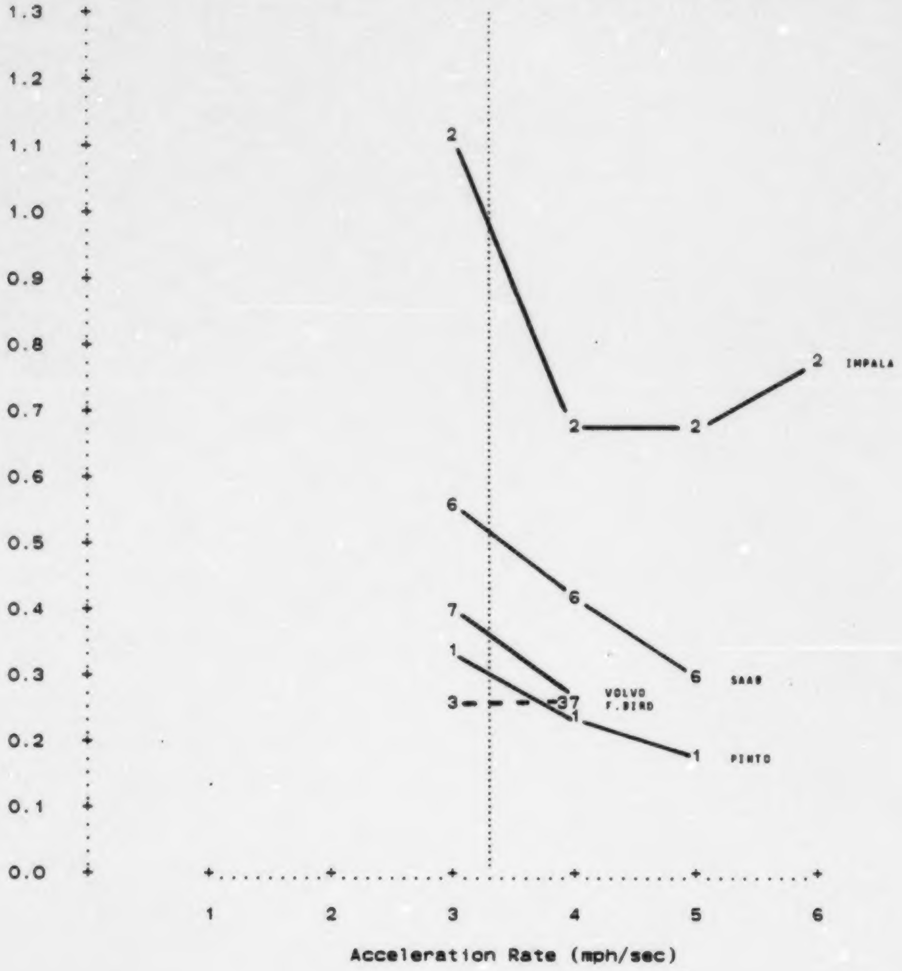




Comparison of Total CO Emissions (grams per maneuver)
During Accelerations from 30 to 60 MPH
With Dynamometer Rollers Coupled

Comparison of Total NOx Emissions (grams per maneuver)
During Accelerations from 30 to 60 MPH
With Dynamometer Rollers **not** Coupled



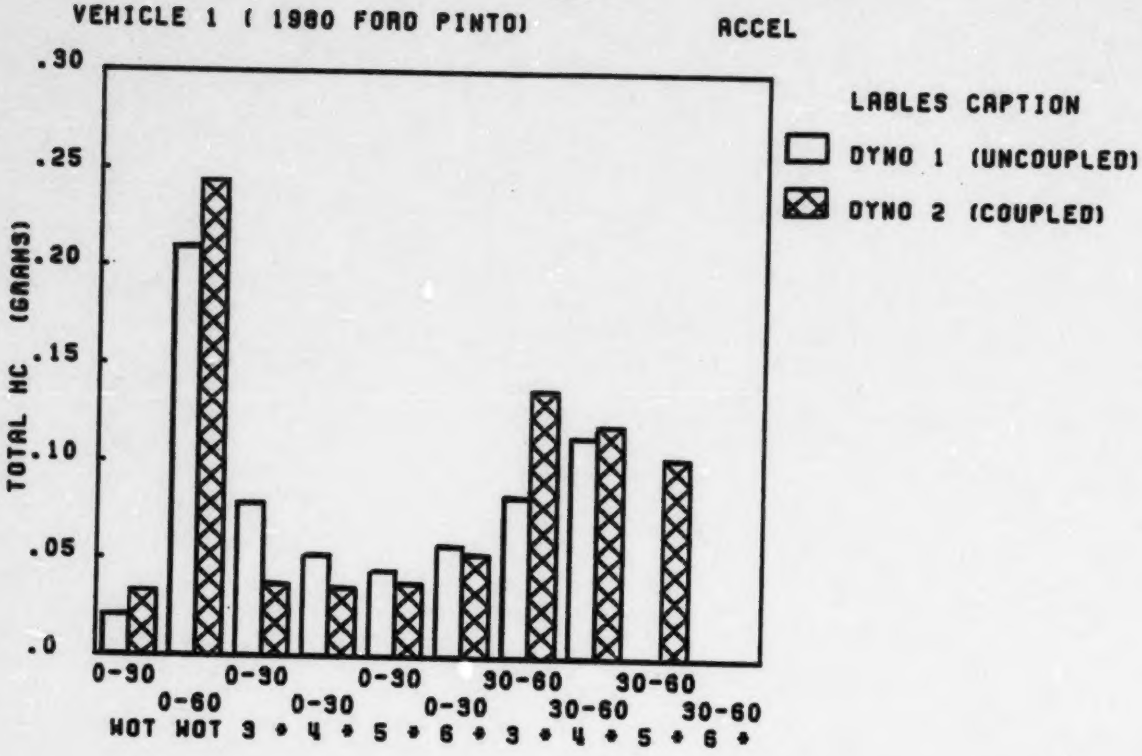


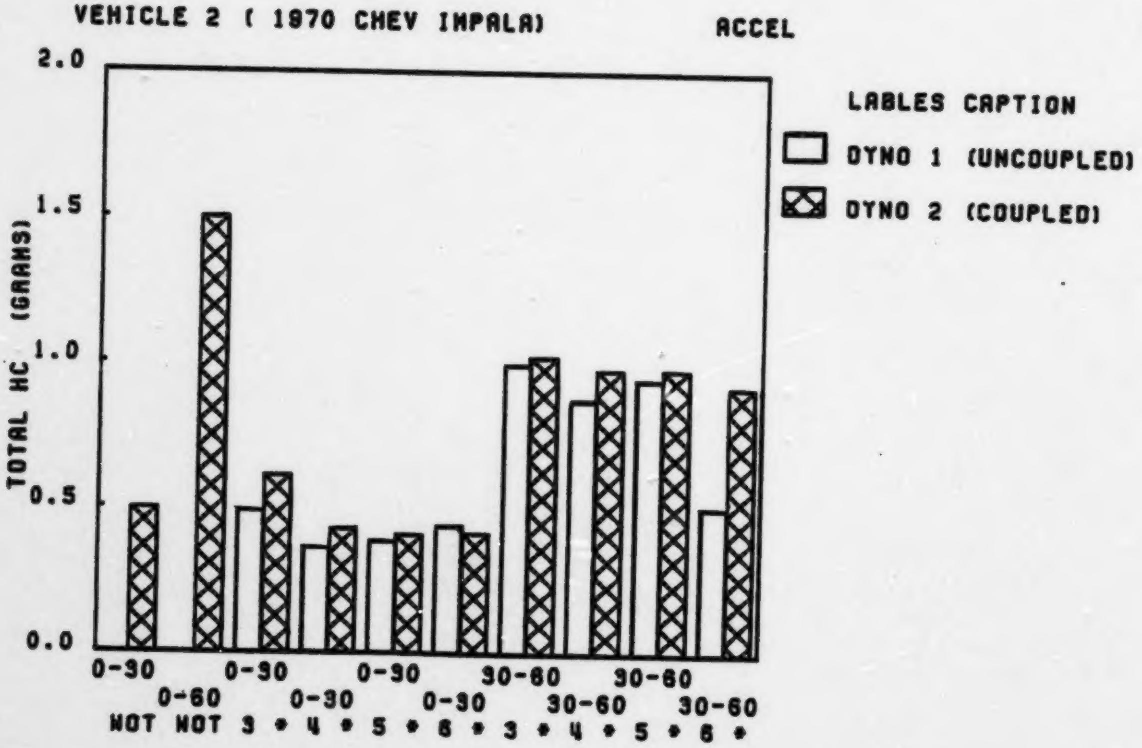
Comparison of Total NOx Emissions (grams per maneuver)
During Accelerations from 30 to 60 MPH
With Dynamometer Rollers Coupled

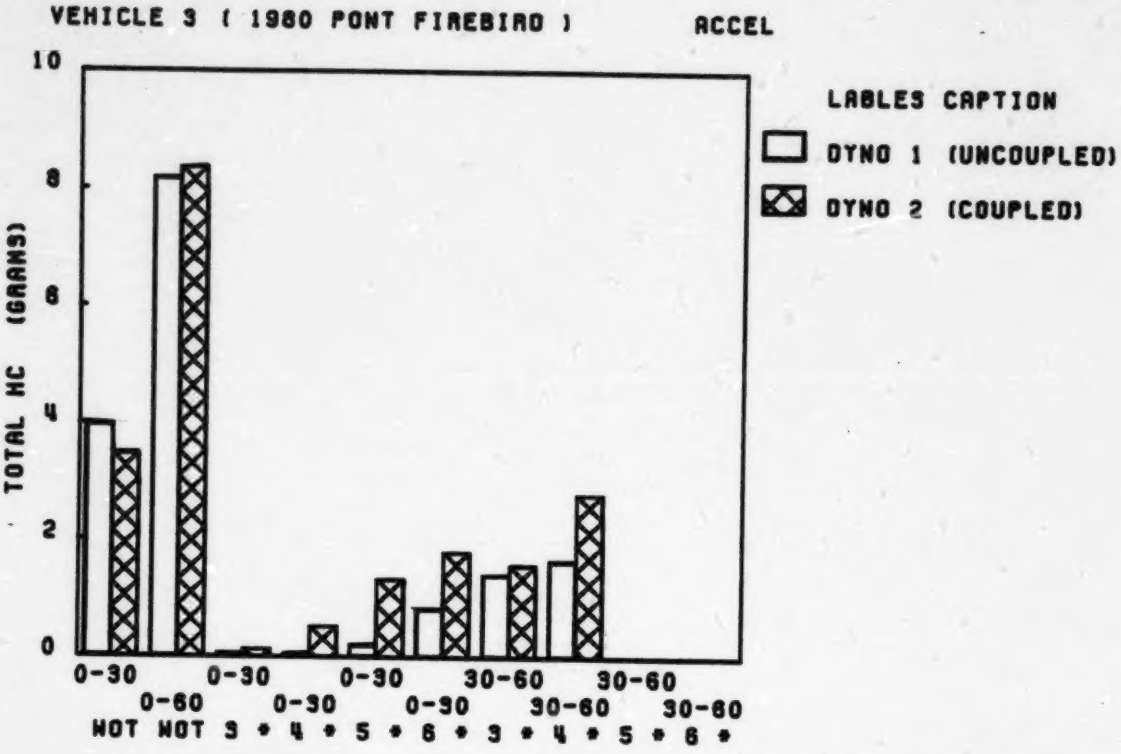
Appendix G-1

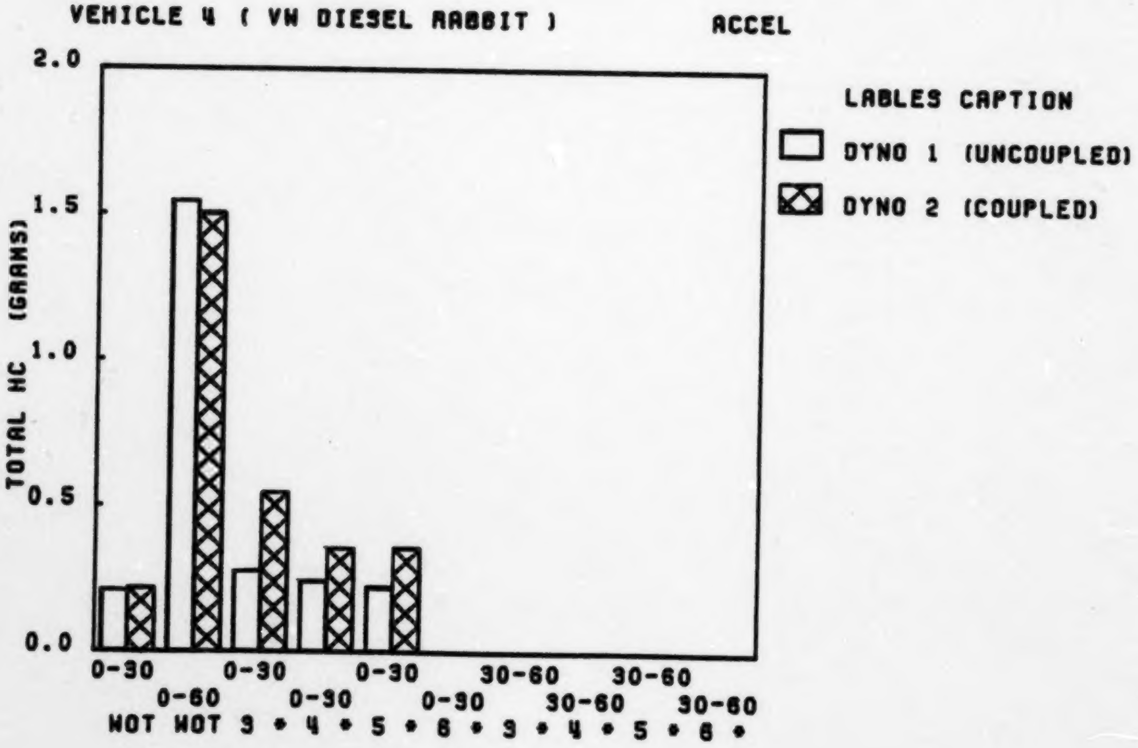
Comparisons of the Average Total HC Emissions (grams) during the Various Acceleration Cycles.

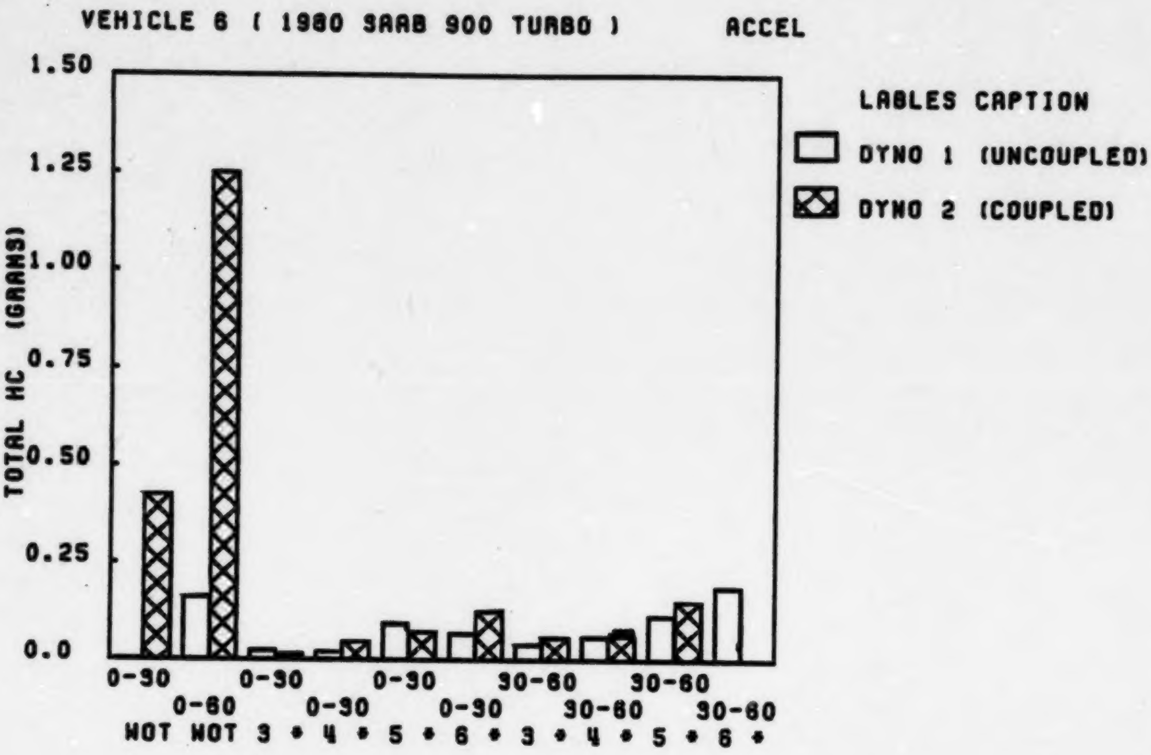
(These histograms are based on data in Tables D7 through D18 in Appendix D.)

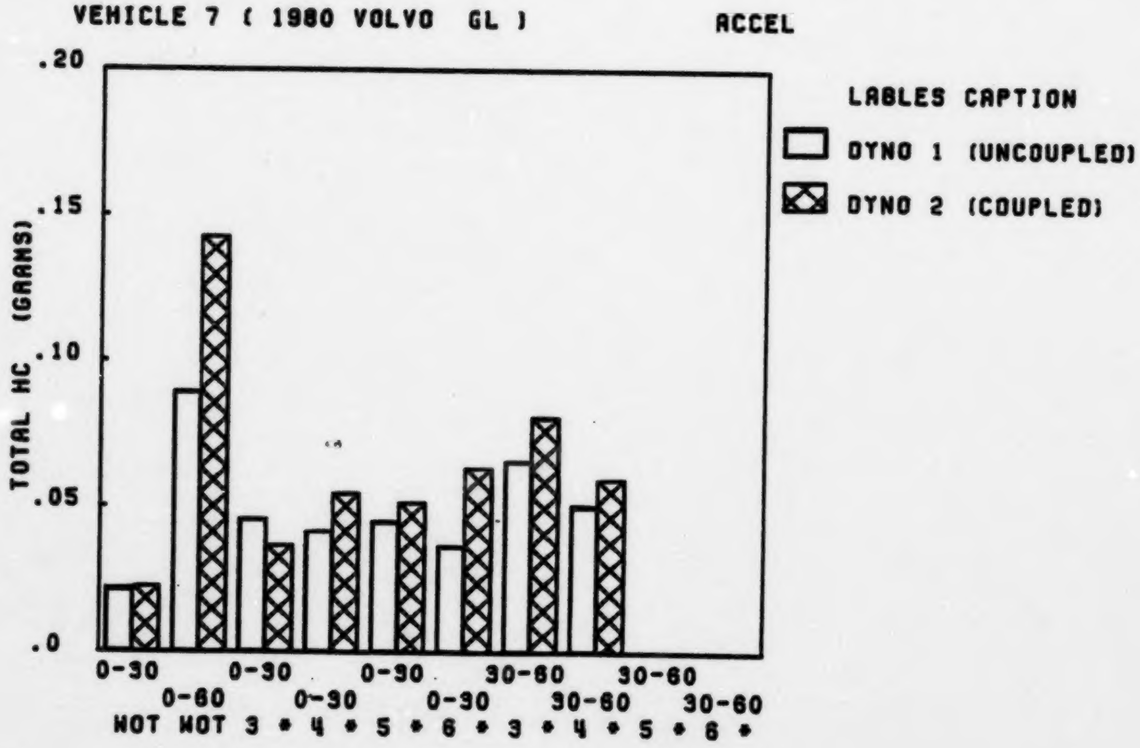

VEHICLE 1 (1980 FORD PINTO)
ACCEL
LABLES CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)
TOTAL HC (GRAMS)
.30
.25
.20
.15
.10
.05
.0
0-30
0-60
0-30
0-30
0-30
0-30
30-60
30-60
30-60
30-60
HOT HOT 3 * 4 * 5 * 6 * 3 * 4 * 5 * 6 *


VEHICLE 2 (1970 CHEV IMPALA)
ACCEL
LABLES CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)
TOTAL HC (GRAMS)
2.0
1.5
1.0
0.5
0.0
0-30
0-60
0-30
0-30
0-30
0-30
30-60
30-60
30-60
30-60
HOT HOT 3 * 4 * 5 * 6 * 3 * 4 * 5 * 6 *


VEHICLE 3 (1980 PONT FIREBIRD)
ACCEL
TOTAL HC (GRAMS)
10
8
6
4
2
0
LABLES CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)
0-30
0-60
0-30
0-30
0-30
0-30
30-60
30-60
30-60
30-60
HOT HOT 3 * 4 * 5 * 6 * 3 * 4 * 5 * 6 *


VEHICLE 4 (VW DIESEL RABBIT)
ACCEL
TOTAL HC (GRAMS)
2.0
1.5
1.0
0.5
0.0
LABLES CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)
0-30
0-60
0-30
0-30
0-30
0-30
30-60
30-60
30-60
30-60
HOT HOT 3 * 4 * 5 * 6 * 3 * 4 * 5 * 6 *

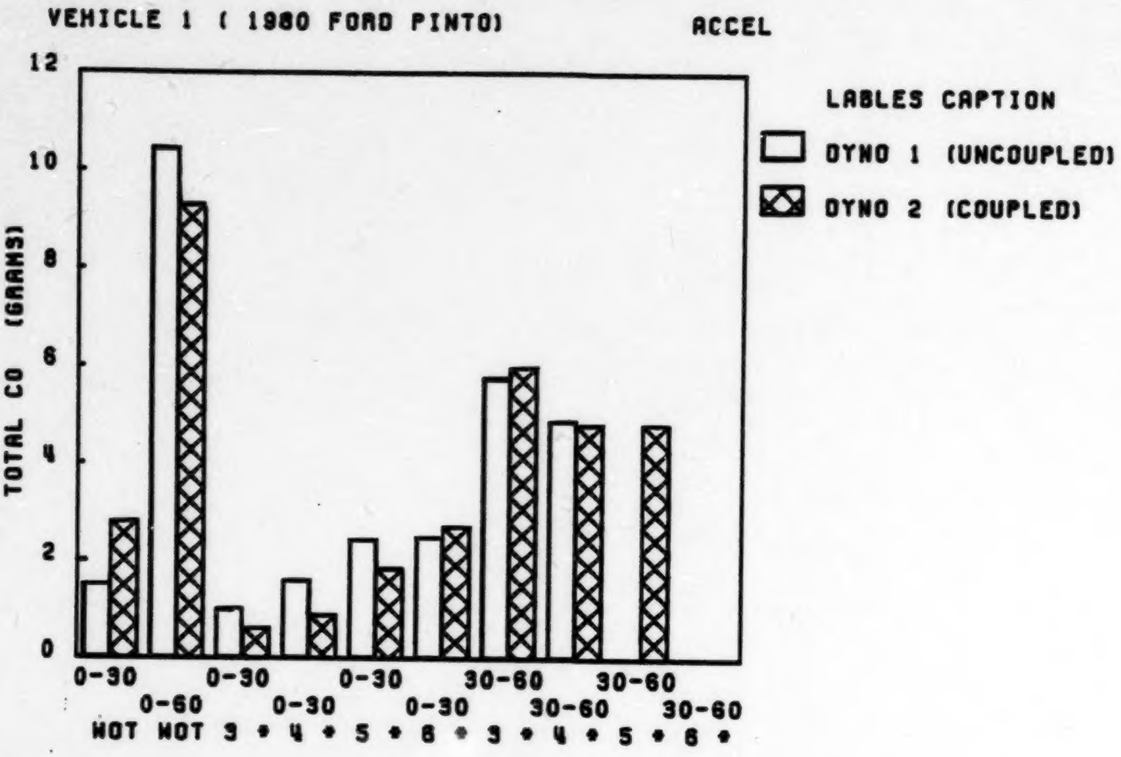

VEHICLE 6 (1980 SAAB 900 TURBO)
ACCEL
1.50
1.25
1.00
0.75
0.50
0.25
0.0
TOTAL HC (GRAMS)
LABLES CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)
0-30
0-60
0-30
0-30
0-30
0-30
30-60
30-60
30-60
30-60
WOT WOT 3 * 4 * 5 * 6 * 3 * 4 * 5 * 6 *

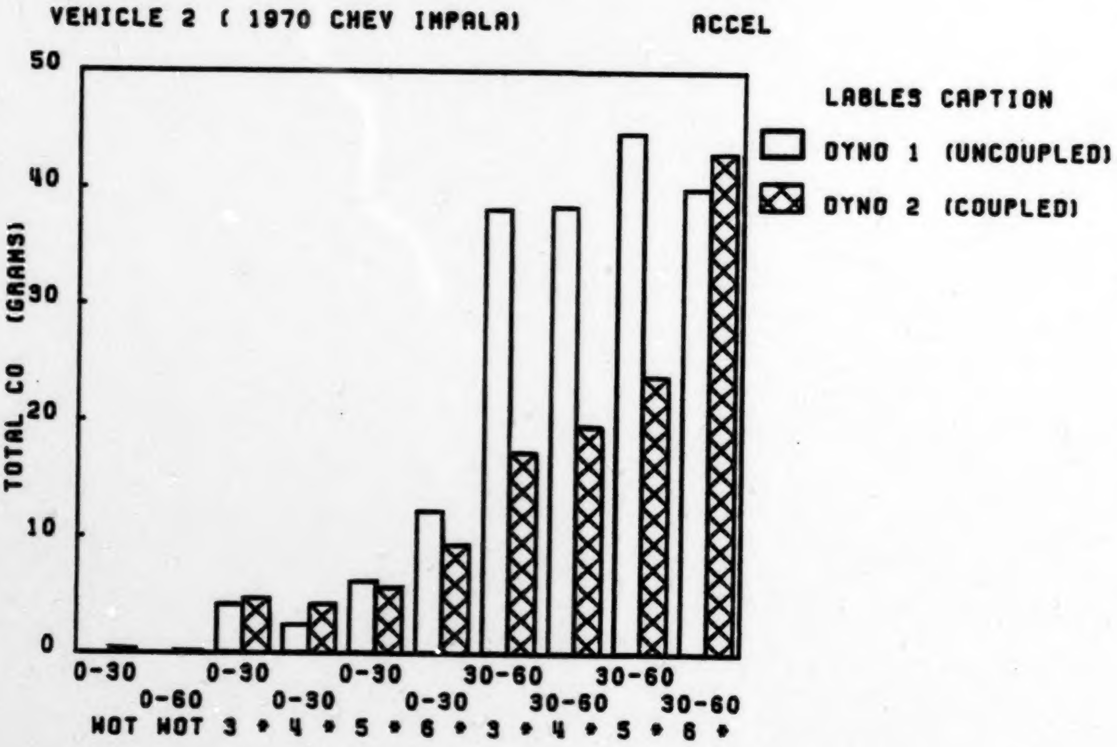

VEHICLE 7 (1980 VOLVO GL)
ACCEL
.20
.15
.10
.05
.0
TOTAL HC (GRAMS)
LABLES CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)
0-30
0-60
0-30
0-30
0-30
0-30
30-60
30-60
30-60
30-60
WOT WOT 3 * 4 * 5 * 6 * 3 * 4 * 5 * 6 *

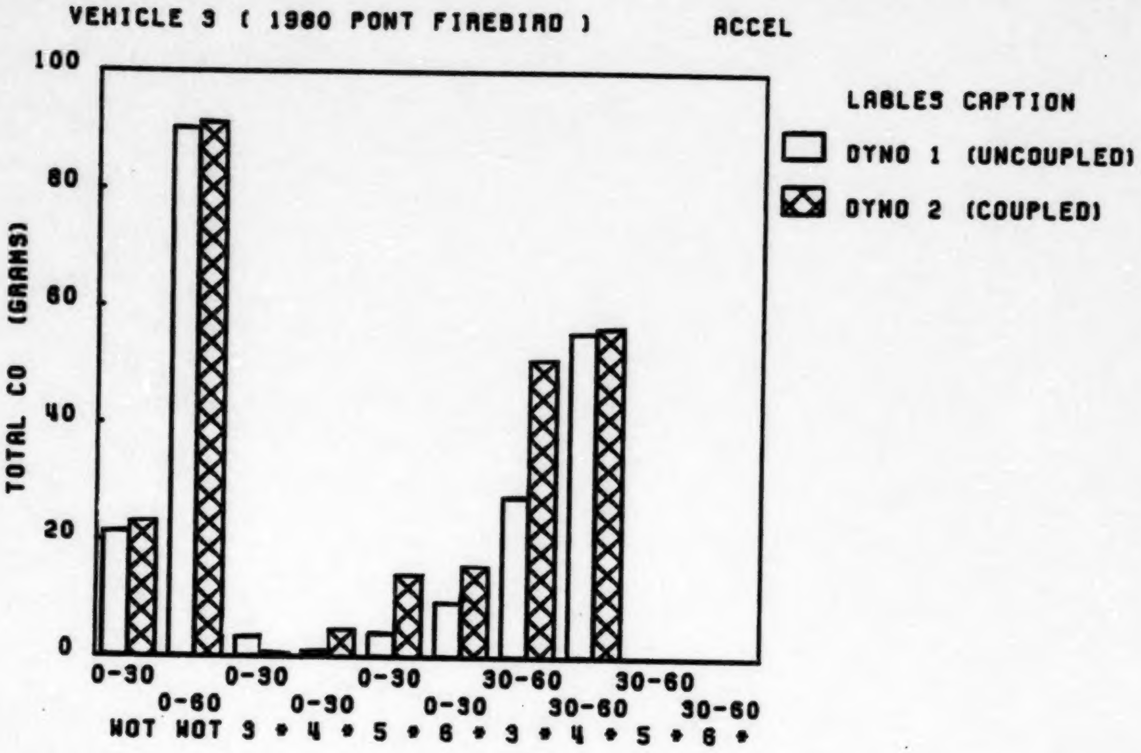
Appendix G-2

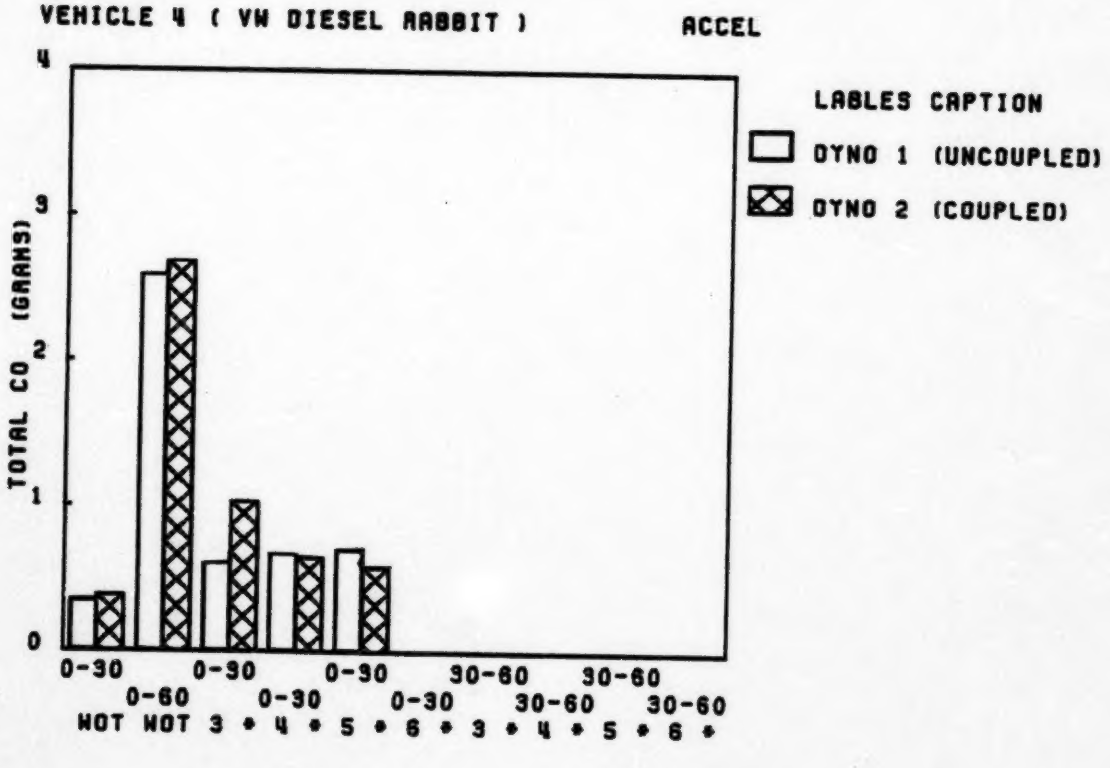
Comparisons of the Average Total CO Emissions (grams) during the Various Acceleration Cycles.

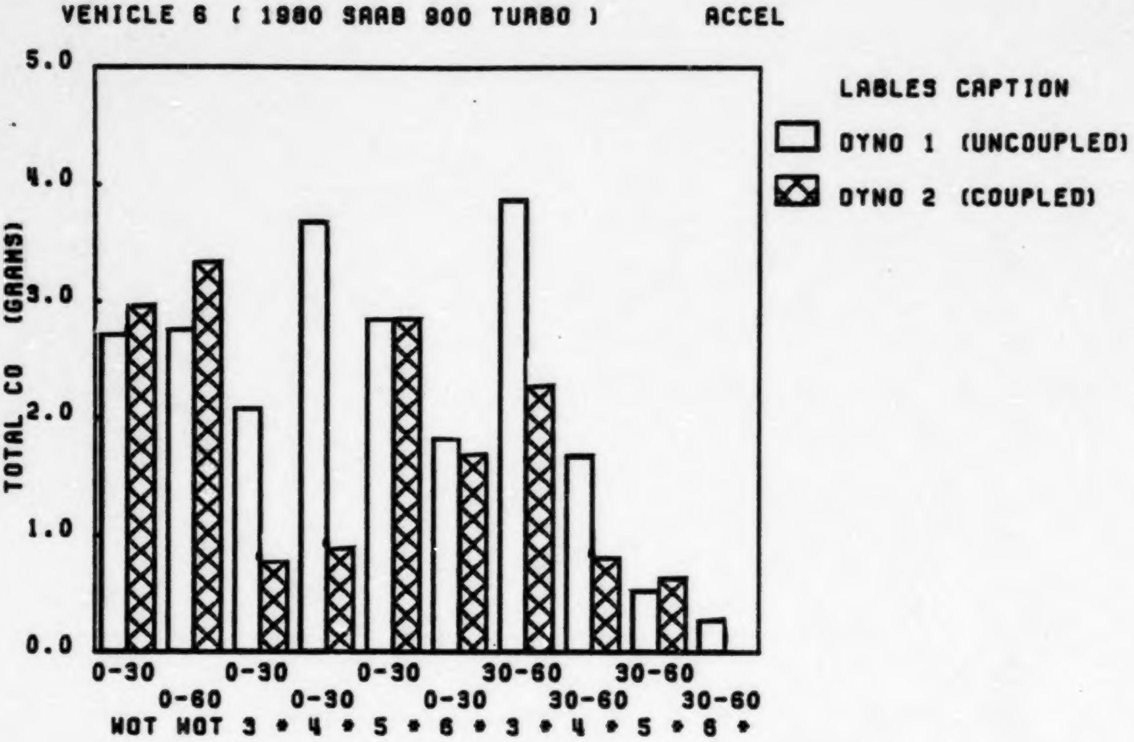
(These histograms are based on data in Tables D7 through D18 in Appendix D.)

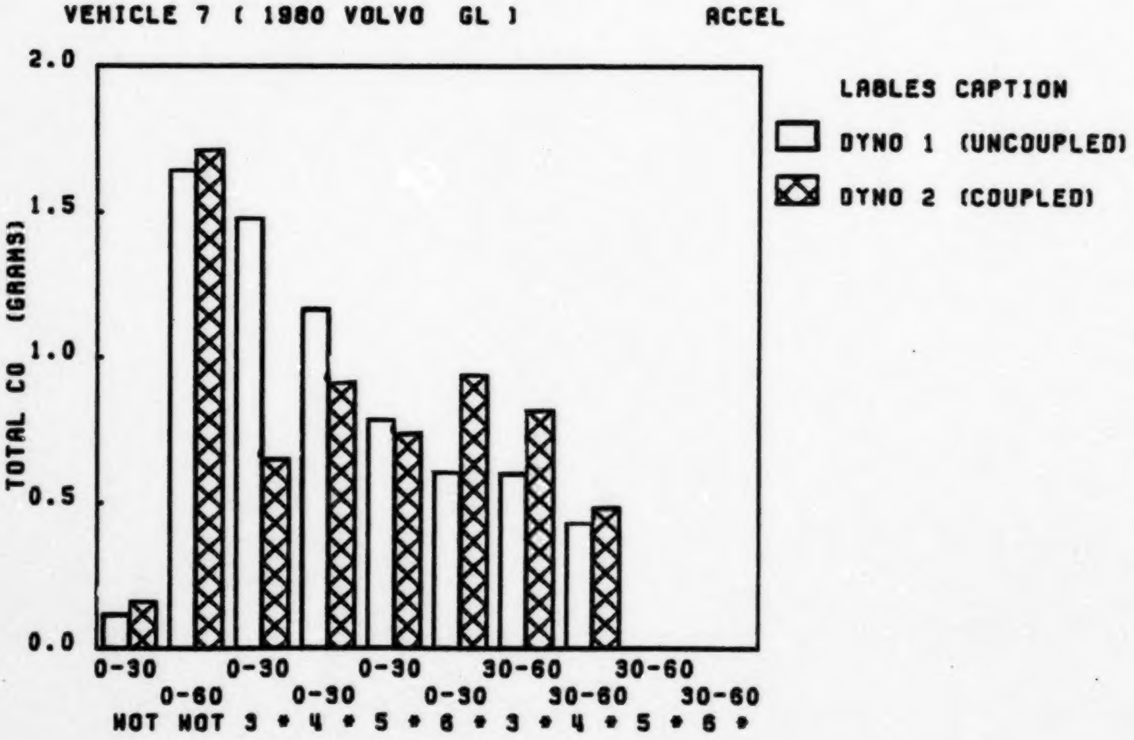

VEHICLE 1 (1980 FORD PINTO)
ACCEL
TOTAL CO (GRAMS)
0
2
4
6
8
10
12
LABLES CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)
0-30
0-60
0-30
0-30
0-30
0-30
30-60
30-60
30-60
30-60
HOT HOT 3 * 4 * 5 * 6 * 3 * 4 * 5 * 6 *


VEHICLE 2 (1970 CHEV IMPALA)
ACCEL
TOTAL CO (GRAMS)
0
10
20
30
40
50
LABLES CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)
0-30
0-60
0-30
0-30
0-30
0-30
30-60
30-60
30-60
30-60
HOT HOT 3 * 4 * 5 * 6 * 3 * 4 * 5 * 6 *


VEHICLE 3 (1980 PONT FIREBIRD) ACCEL


VEHICLE 4 (VW DIESEL RABBIT) ACCEL

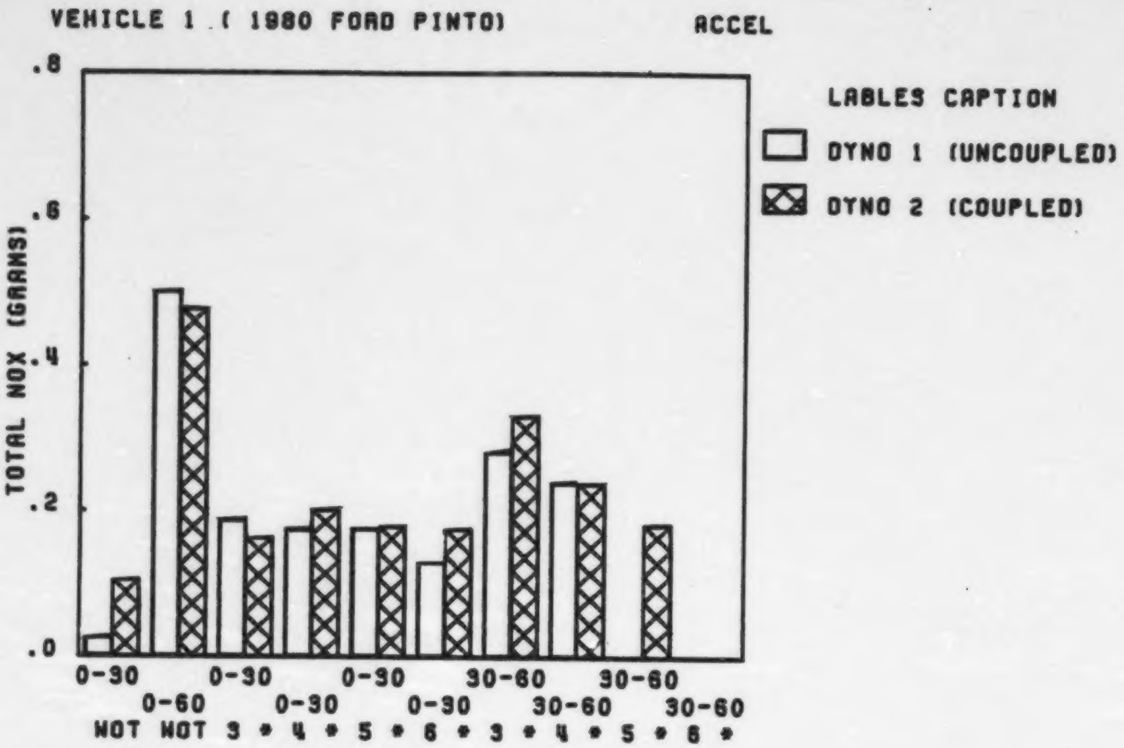

VEHICLE 6 (1980 SAAB 900 TURBO) ACCEL
TOTAL CO (GRAMS)
5.0
4.0
3.0
2.0
1.0
0.0
LABLES CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)
0-30
0-60
0-30
0-30
0-30
0-30
30-60
30-60
30-60
30-60
HOT HOT 3 * 4 * 5 * 6 * 3 * 4 * 5 * 6 *

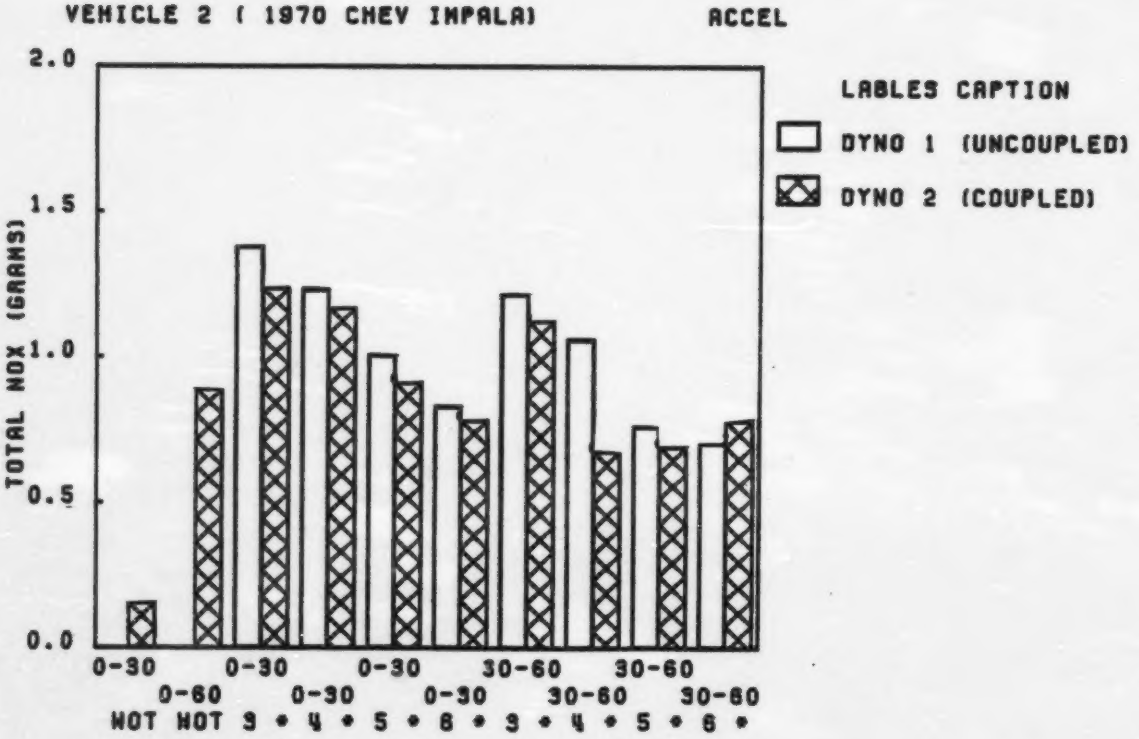

VEHICLE 7 (1980 VOLVO GL) ACCEL
TOTAL CO (GRAMS)
2.0
1.5
1.0
0.5
0.0
LABLES CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)
0-30
0-60
0-30
0-30
0-30
0-30
30-60
30-60
30-60
30-60
HOT HOT 3 * 4 * 5 * 6 * 3 * 4 * 5 * 6 *

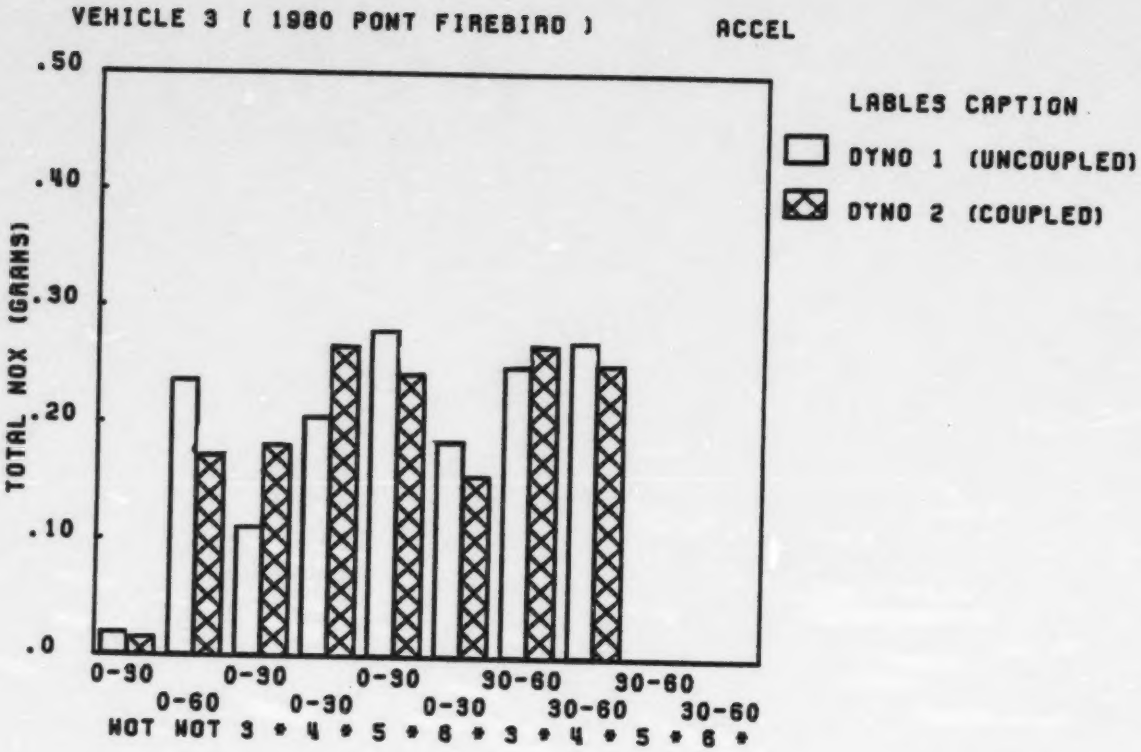
Appendix G-3

Comparisons of the Average Total NOx Emissions (grams) during the Various Acceleration Cycles.

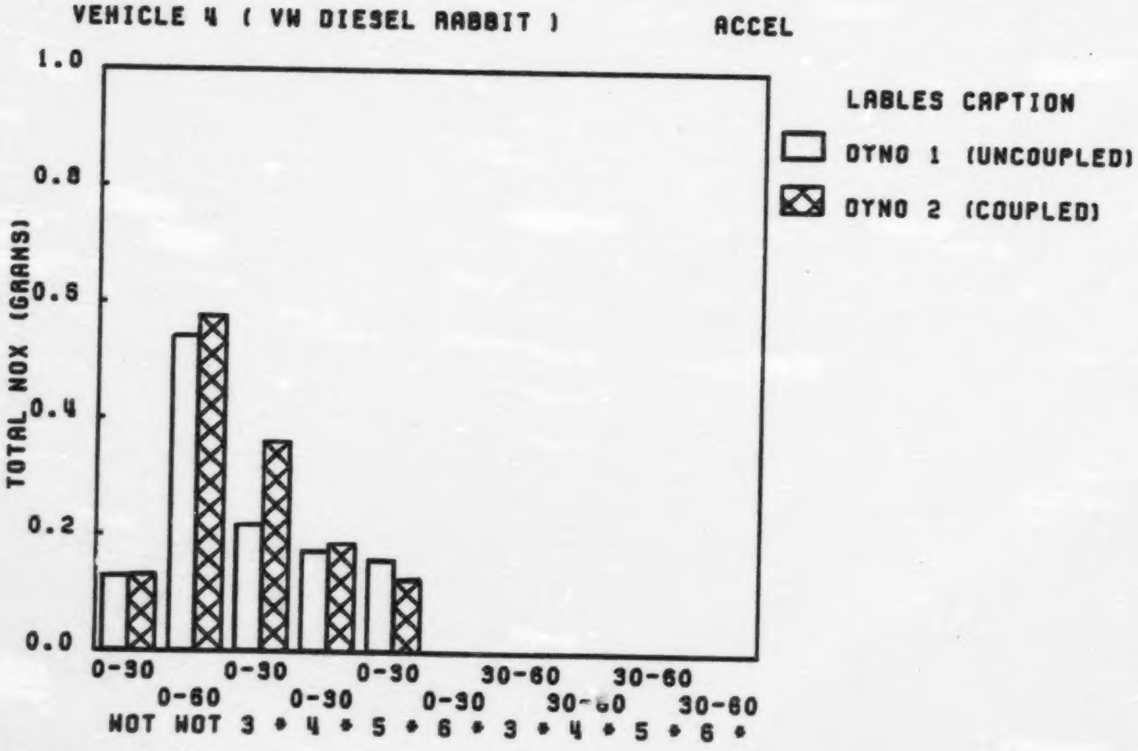
(These histograms are based on data in Tables D7 through D18 in Appendix D.)


VEHICLE 1 (1980 FORD PINTO)
ACCEL
LABLES CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)
TOTAL NOX (GRAMS)
.8
.6
.4
.2
.0
0-30
0-60
0-30
0-30
0-30
0-30
30-60
30-60
30-60
30-60
HOT HOT 3 * 4 * 5 * 6 * 3 * 4 * 5 * 6 *

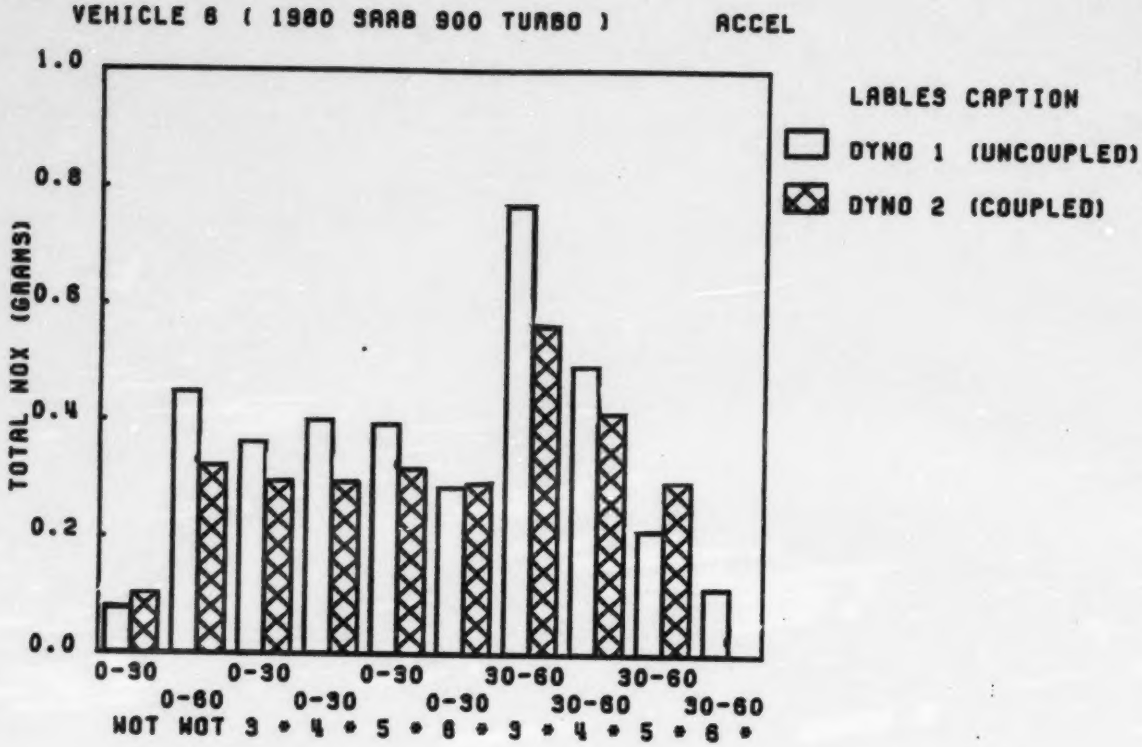

VEHICLE 2 (1970 CHEV IMPALA)
ACCEL
LABLES CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)
TOTAL NOX (GRAMS)
2.0
1.5
1.0
0.5
0.0
0-30
0-60
0-30
0-30
0-30
0-30
30-60
30-60
30-60
30-60
HOT HOT 3 * 4 * 5 * 6 * 3 * 4 * 5 * 6 *



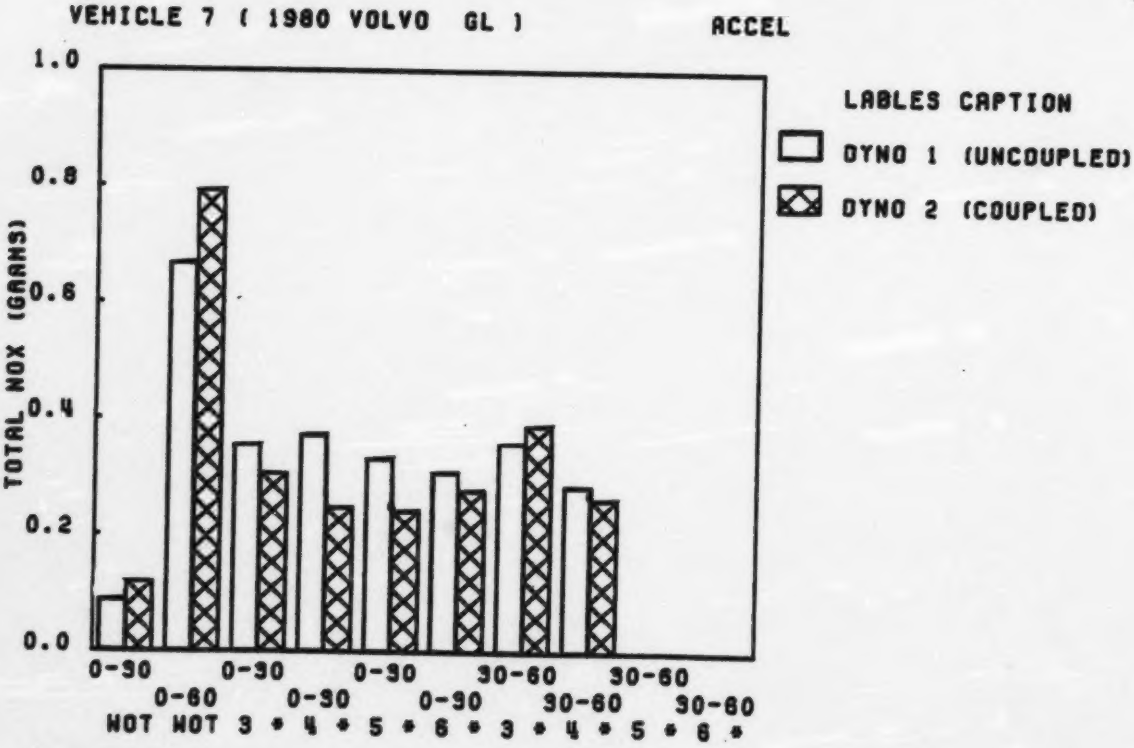
VEHICLE 3 (1980 PONT FIREBIRD) ACCEL



VEHICLE 4 (VW DIESEL RABBIT) ACCEL



VEHICLE 6 (1980 SAAB 900 TURBO) ACCEL

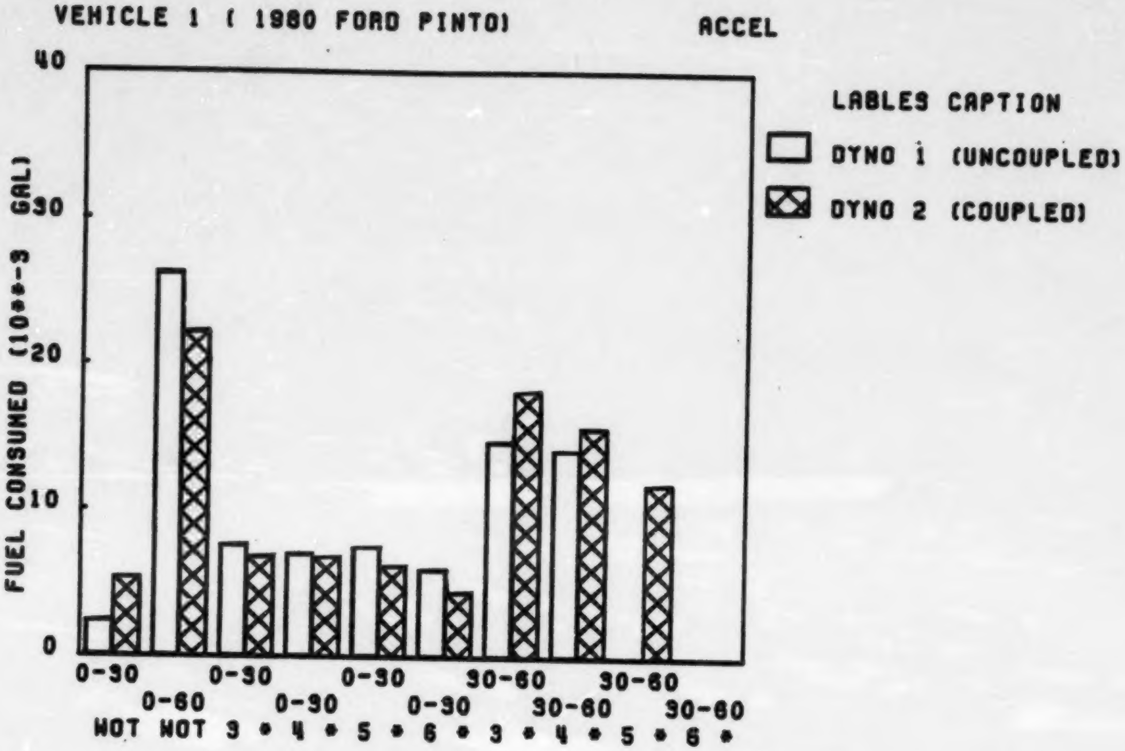


VEHICLE 7 (1980 VOLVO GL) ACCEL

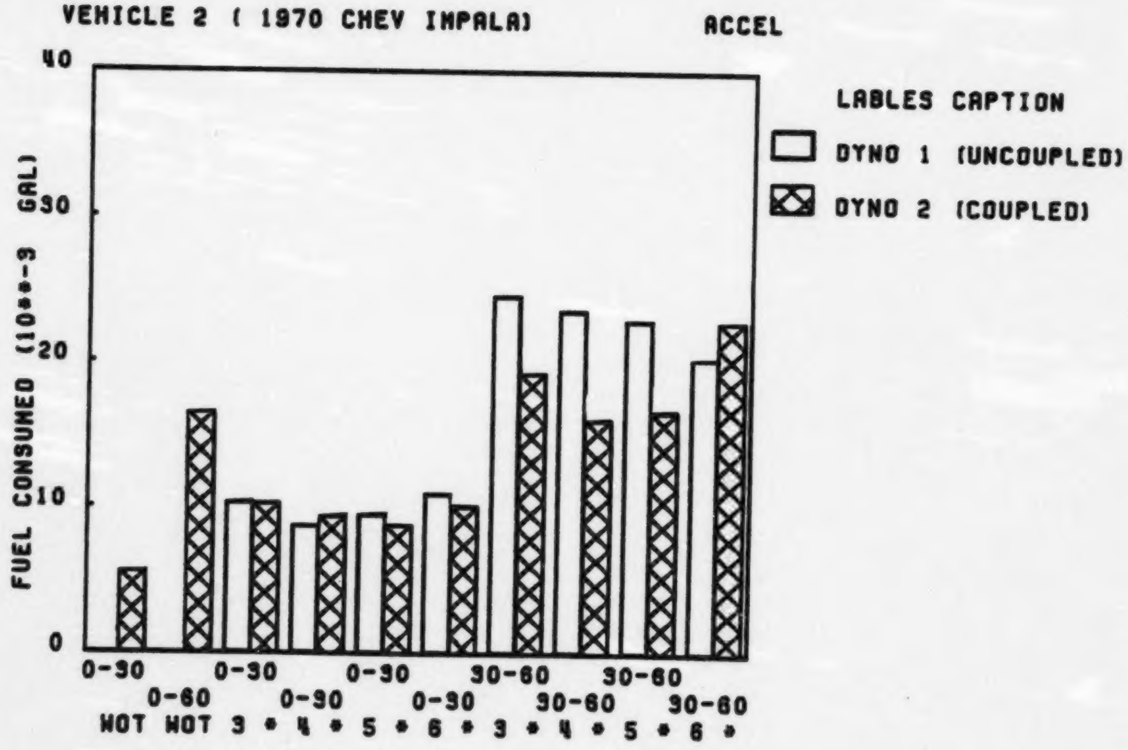
Appendix G-4

Comparisons of the Average Fuel Consumed (thousandths of a gallon) during the Various Acceleration Cycles.

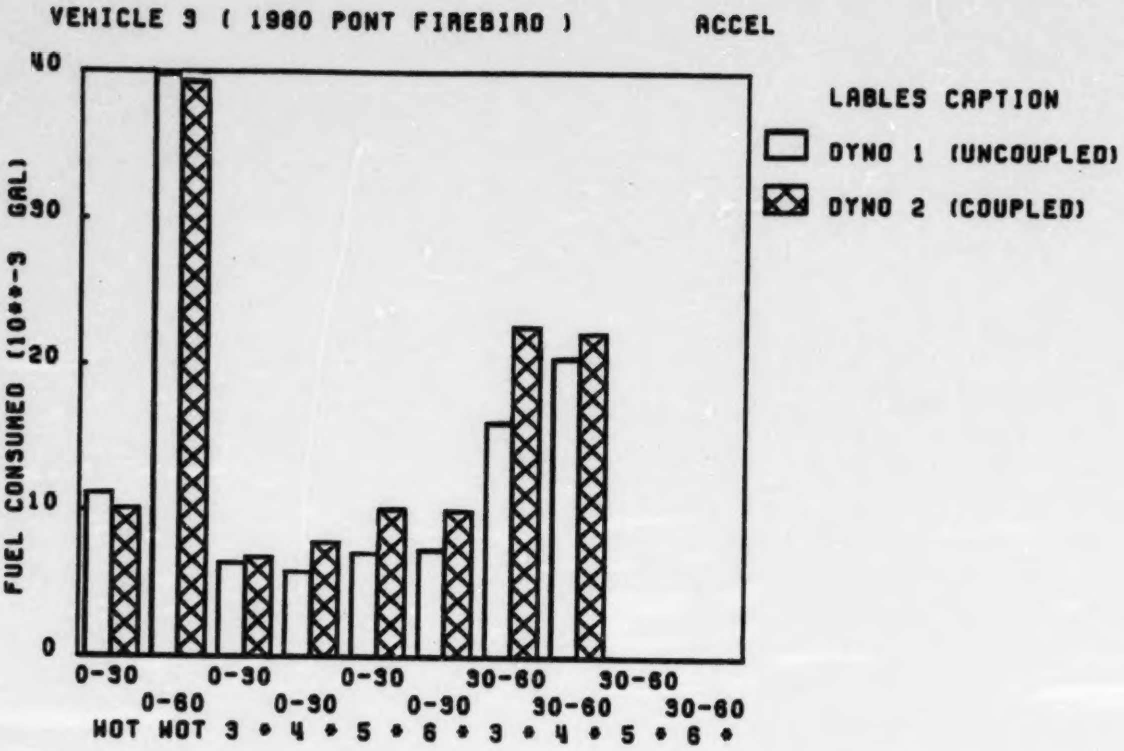
(These histograms are based on data in Tables D7 through D18 in Appendix D.)

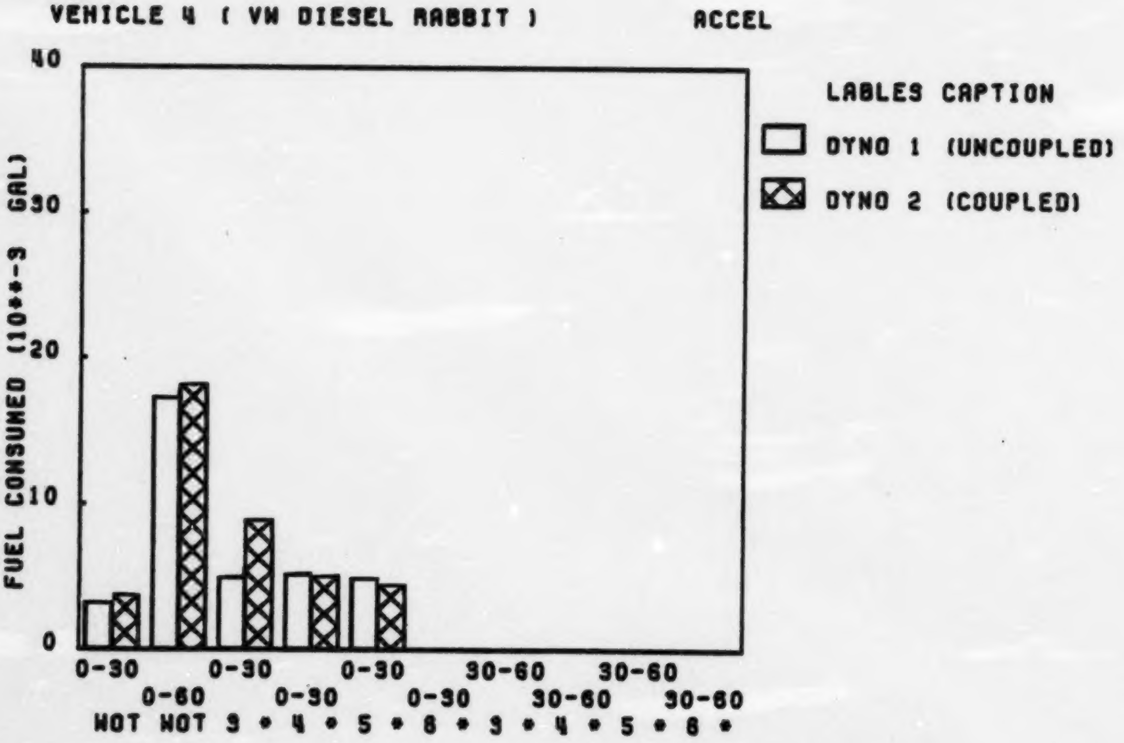


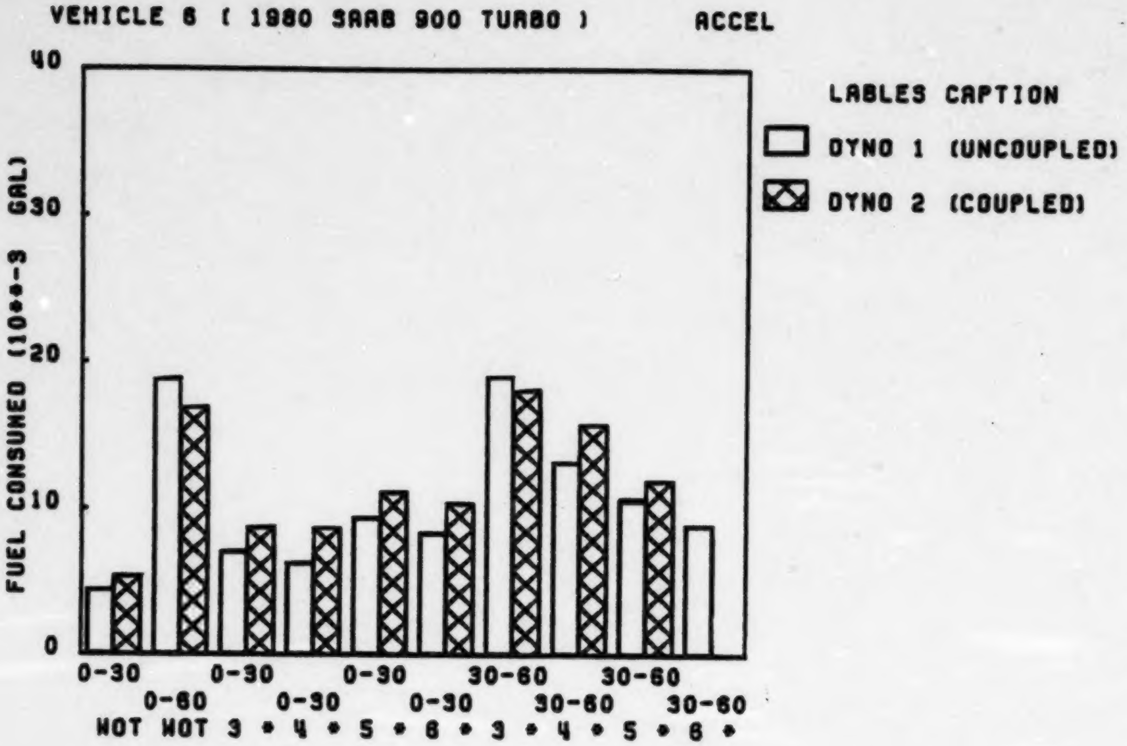
VEHICLE 1 (1980 FORD PINTO) ACCEL

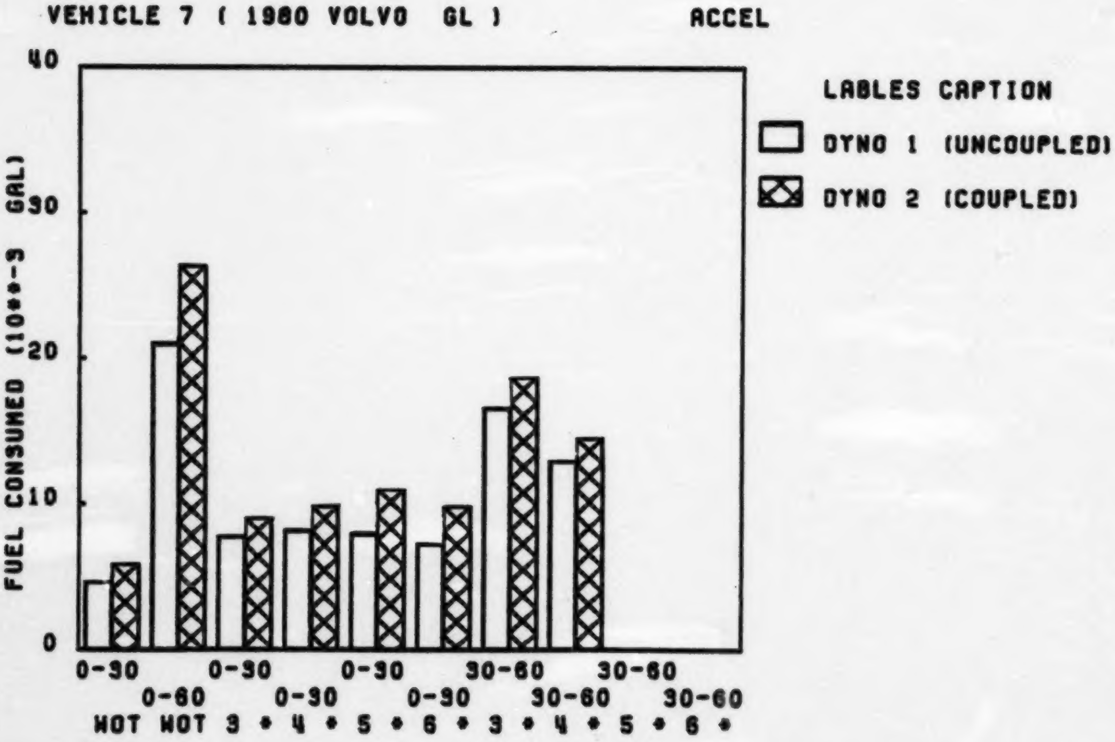


VEHICLE 2 (1970 CHEV IMPALA) ACCEL


VEHICLE 3 (1980 PONT FIREBIRD) ACCEL
FUEL CONSUMED (10**-3 GAL)
40
30
20
10
0
LABLES CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)
0-30
0-60
0-30
0-30
0-30
0-30
30-60
30-60
30-60
30-60
HOT HOT 3 * 4 * 5 * 6 * 3 * 4 * 5 * 6 *


VEHICLE 4 (VW DIESEL RABBIT) ACCEL
FUEL CONSUMED (10**-3 GAL)
40
30
20
10
0
LABLES CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)
0-30
0-60
0-30
0-30
0-30
0-30
30-60
30-60
30-60
30-60
HOT HOT 3 * 4 * 5 * 6 * 3 * 4 * 5 * 6 *


VEHICLE 6 (1980 SAAB 900 TURBO) ACCEL
FUEL CONSUMED (10**-3 GAL)
0
10
20
30
40
LABLES CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)
0-30
0-60
0-30
0-30
0-30
0-30
30-60
30-60
30-60
30-60
HOT HOT 3 * 4 * 5 * 6 * 3 * 4 * 5 * 6 *

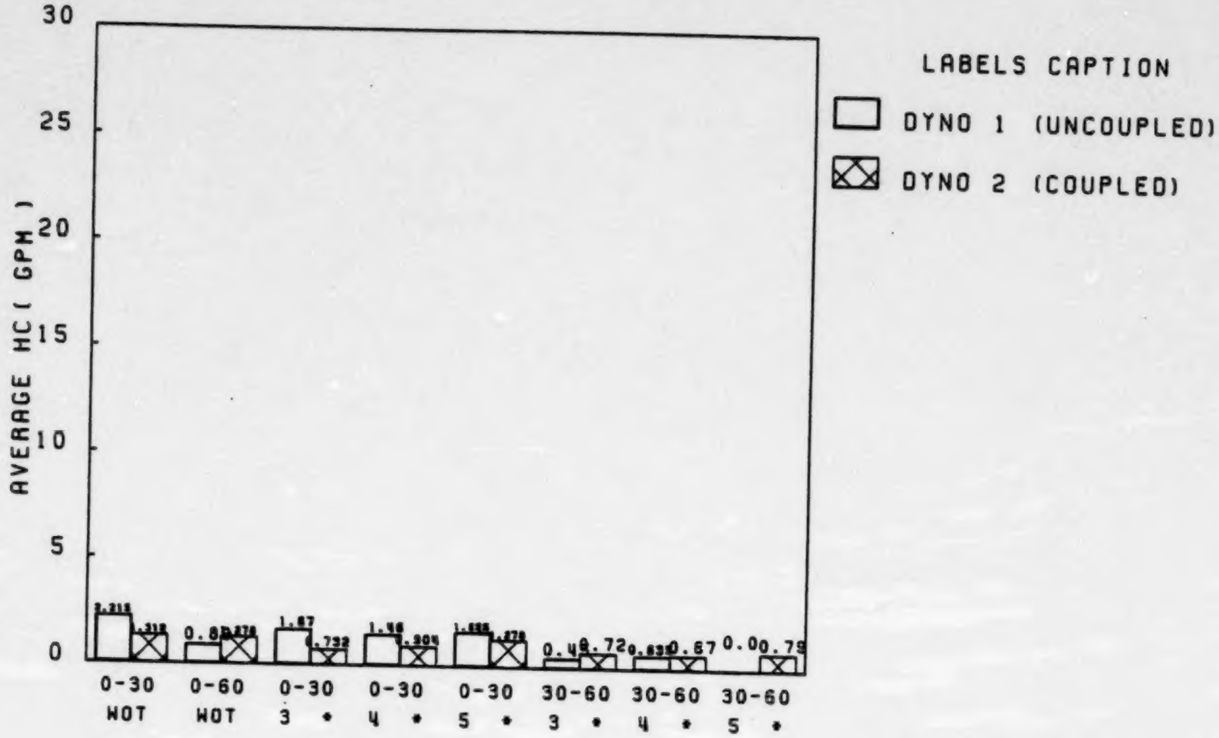

VEHICLE 7 (1980 VOLVO GL) ACCEL
FUEL CONSUMED (10**-3 GAL)
0
10
20
30
40
LABLES CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)
0-30
0-60
0-30
0-30
0-30
0-30
30-60
30-60
30-60
30-60
HOT HOT 3 * 4 * 5 * 6 * 3 * 4 * 5 * 6 *

Appendix H-1

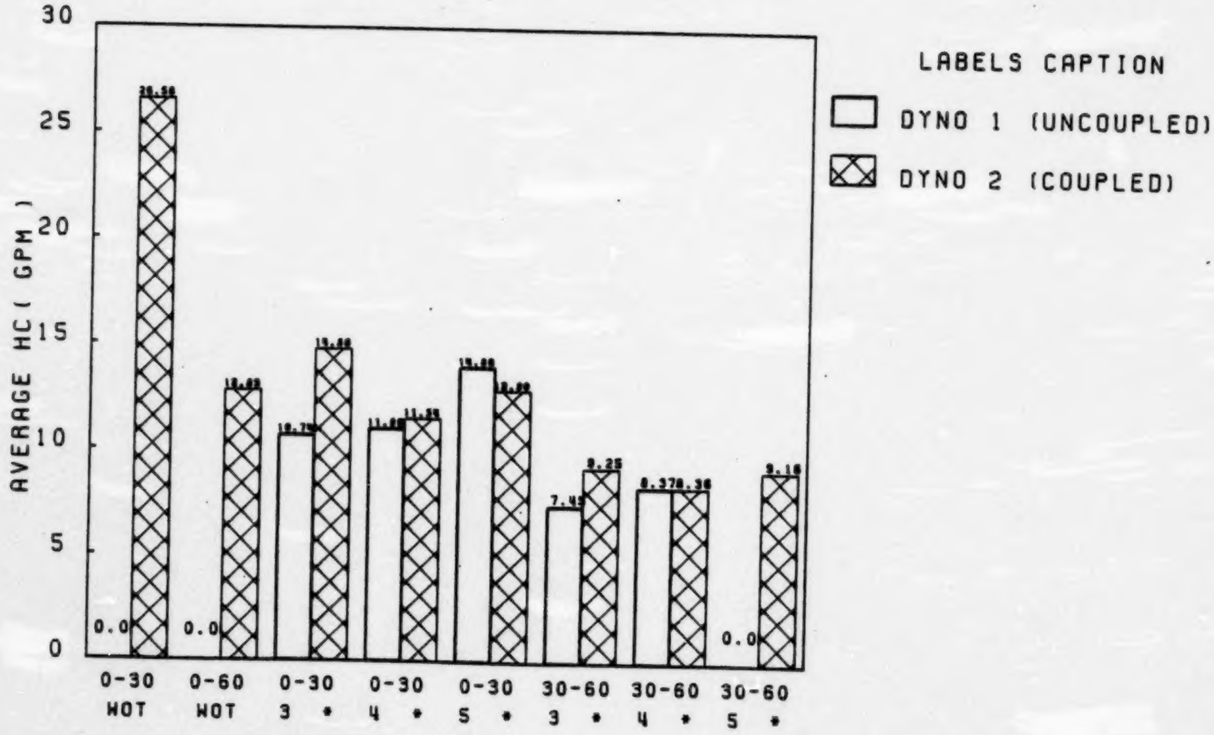
Comparison of the Mean HC Emissions (grams per mile) During the Various Acceleration Cycles.

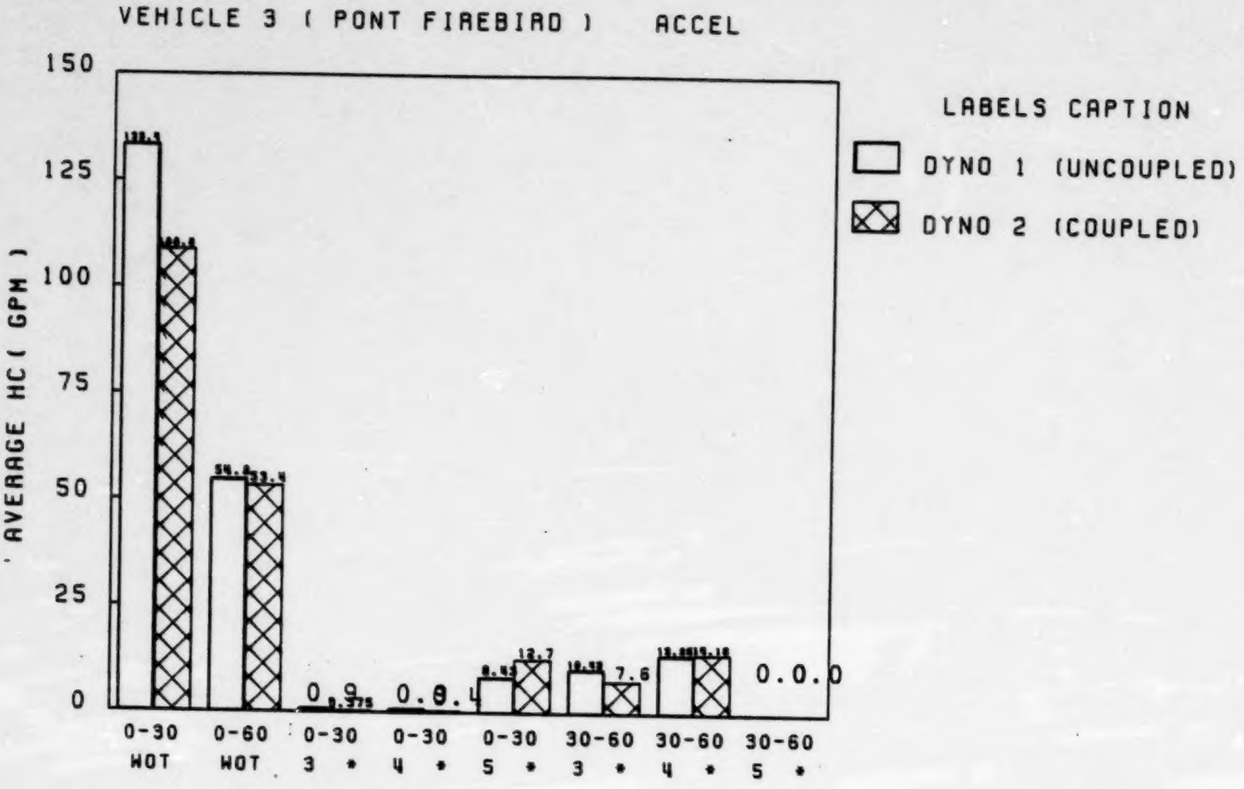
(These histograms are based on data in Tables D19 through D30 in Appendix D).

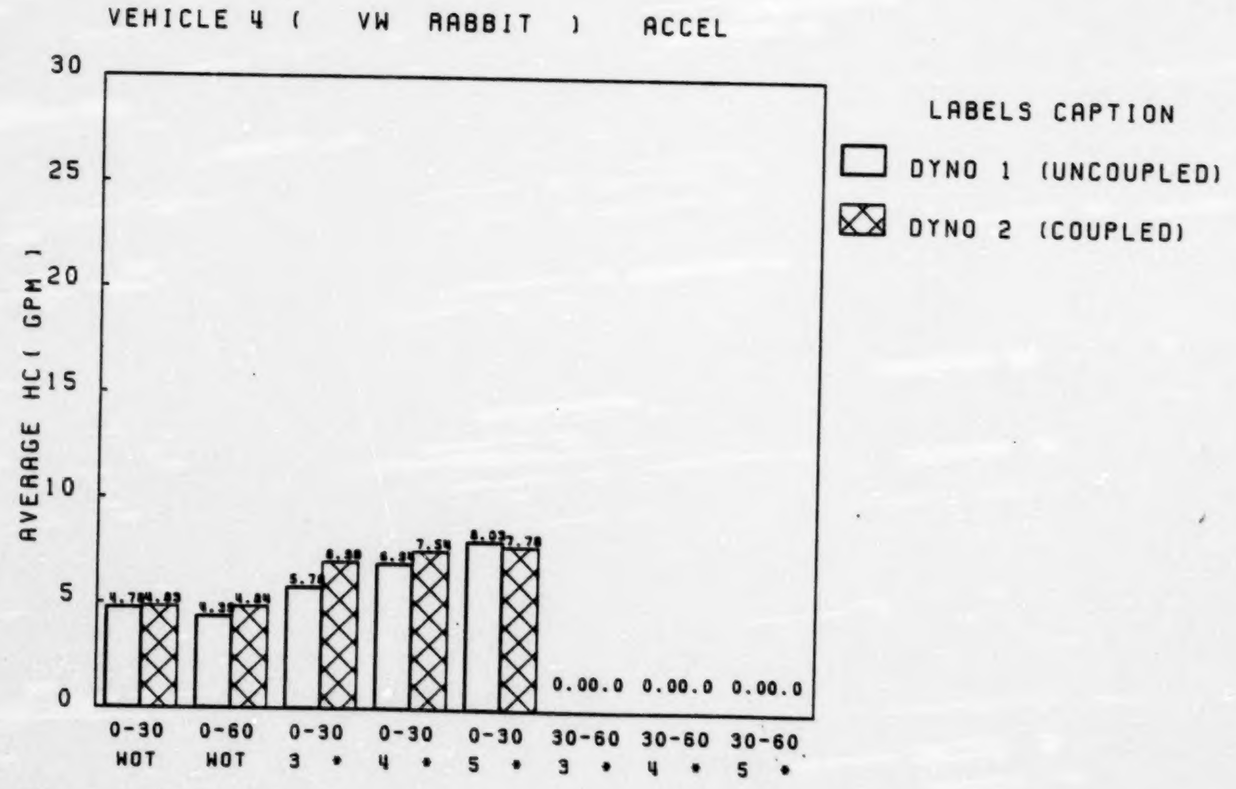
VEHICLE 1 (FORD PINTO) ACCEL



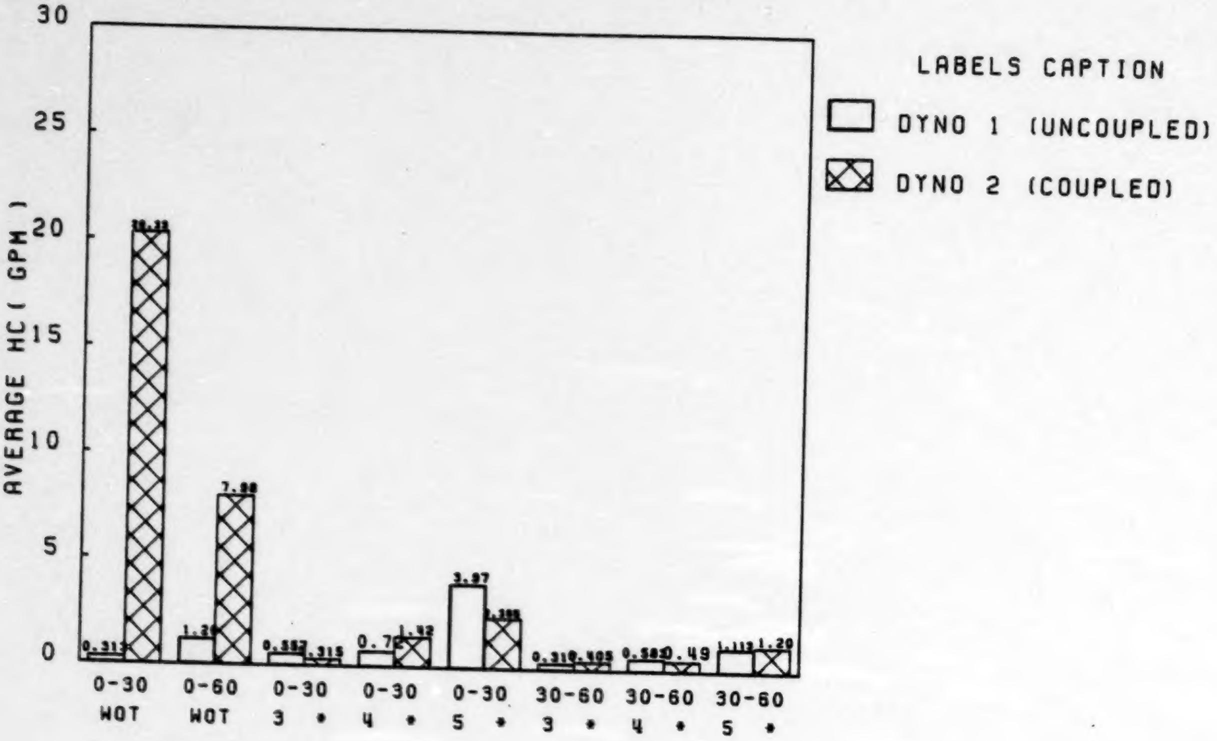
VEHICLE 2 (CHEV IMPALA) ACCEL



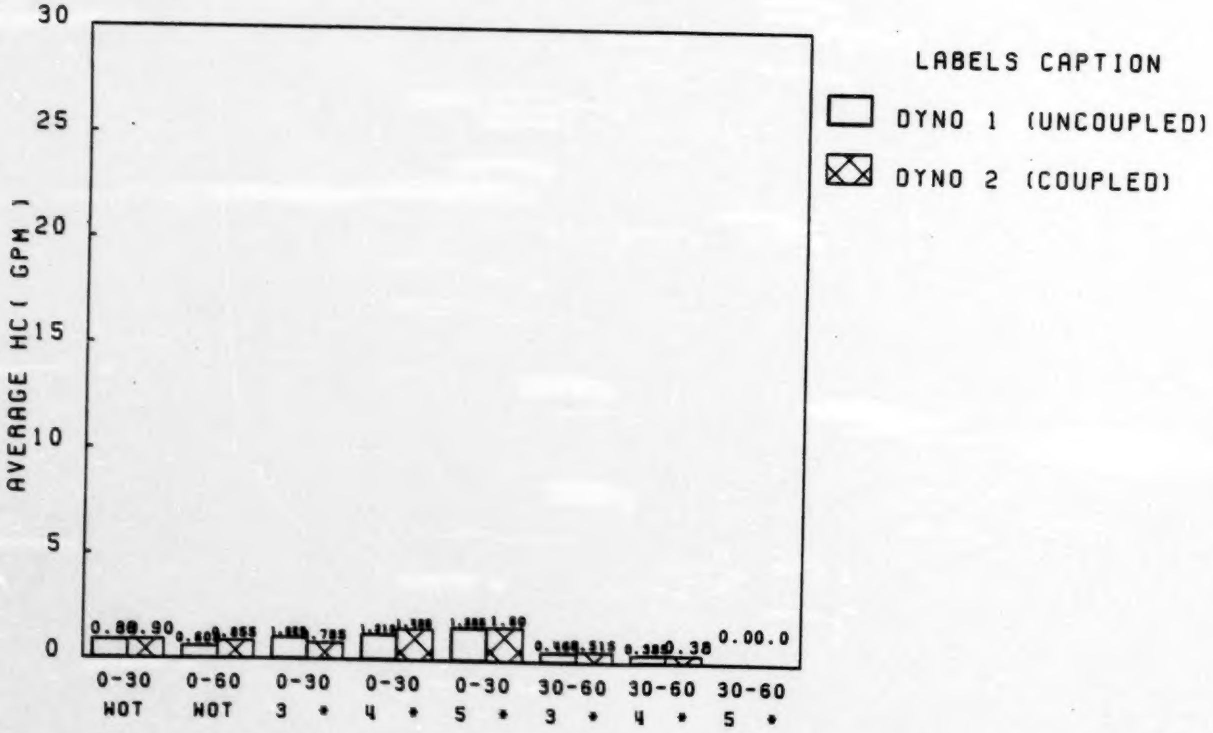

VEHICLE 3 (PONT FIREBIRD) ACCEL
AVERAGE HC (GPM)
150
125
100
75
50
25
0
LABELS CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)
54.0
53.4
0.9
0.375
0.0.4
12.7
7.6
0.0.0
0-30 WOT
0-60 WOT
0-30 3 *
0-30 4 *
0-30 5 *
30-60 3 *
30-60 4 *
30-60 5 *


VEHICLE 4 (VW RABBIT) ACCEL
AVERAGE HC (GPM)
30
25
20
15
10
5
0
LABELS CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)
4.78
4.83
4.84
5.78
7.54
8.03
7.78
0.00.0
0.00.0
0.00.0
0-30 WOT
0-60 WOT
0-30 3 *
0-30 4 *
0-30 5 *
30-60 3 *
30-60 4 *
30-60 5 *

VEHICLE 6 (SAAB 900 TURBO) ACCEL



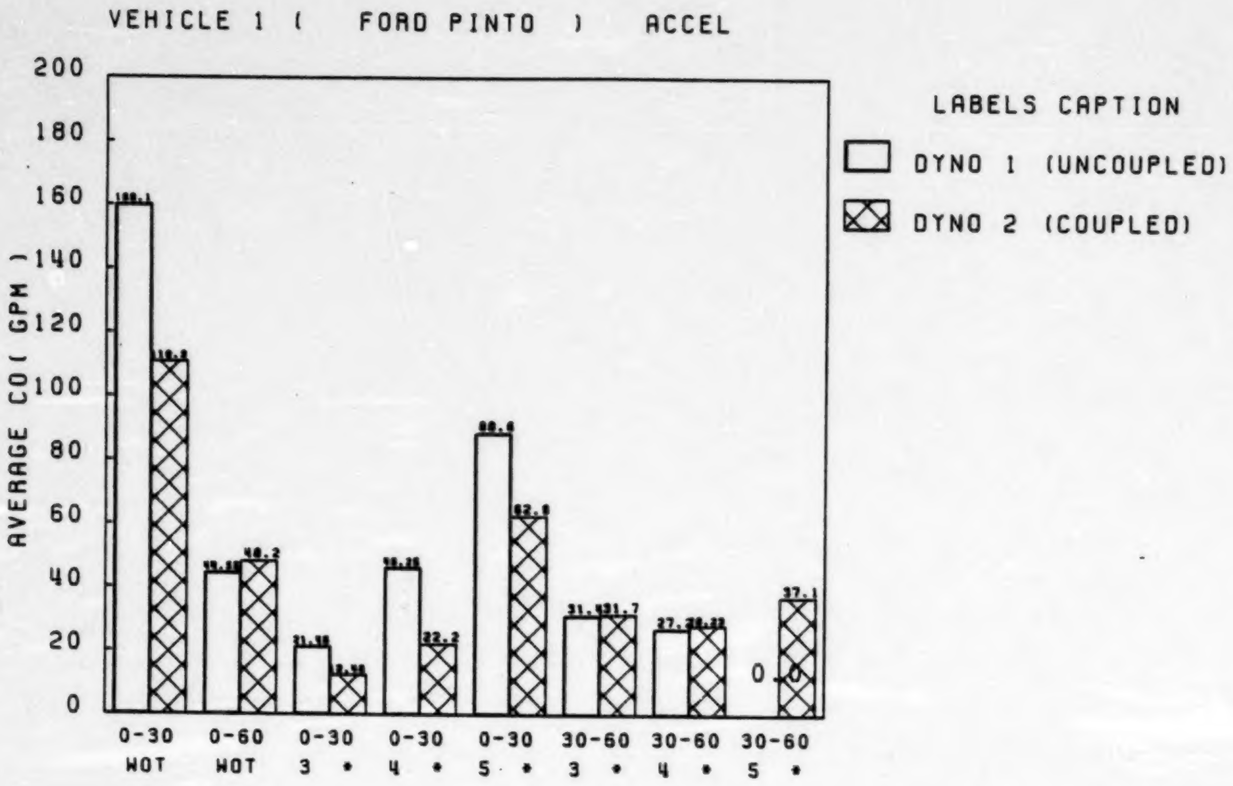
VEHICLE 7 (VOLVO GL) ACCEL

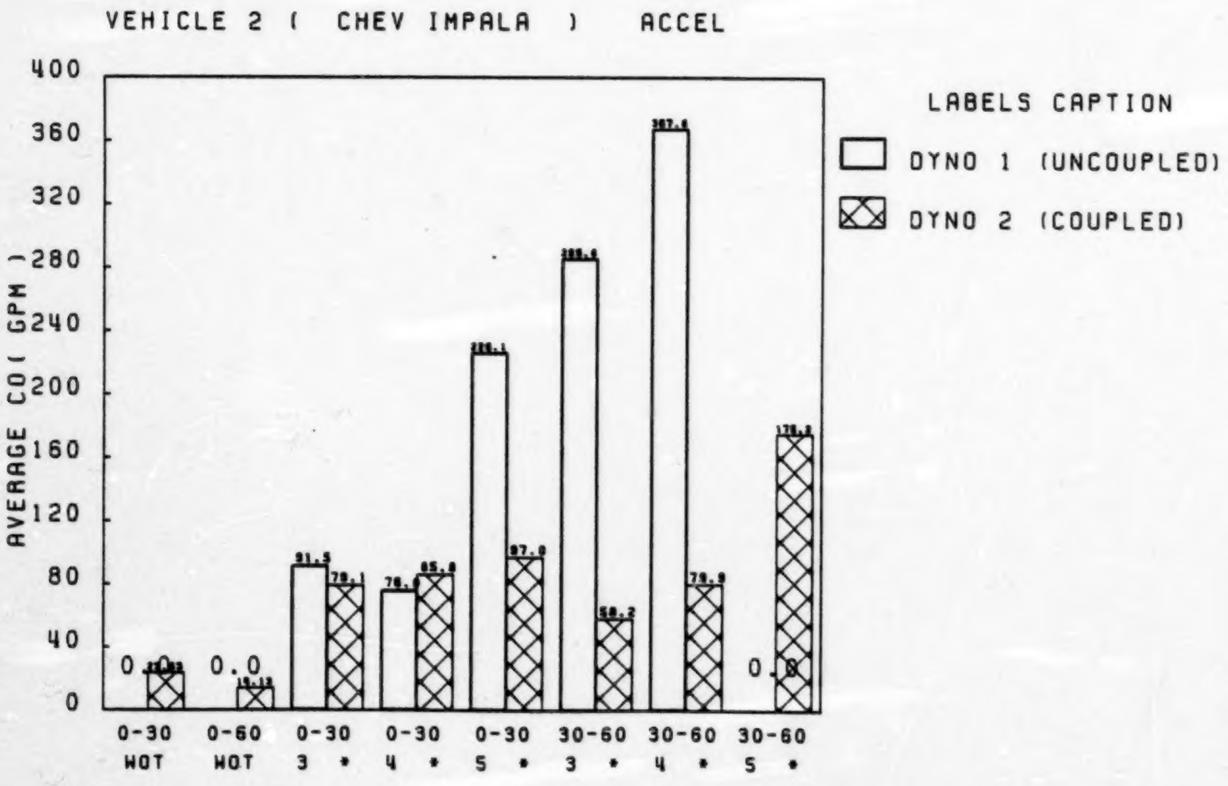


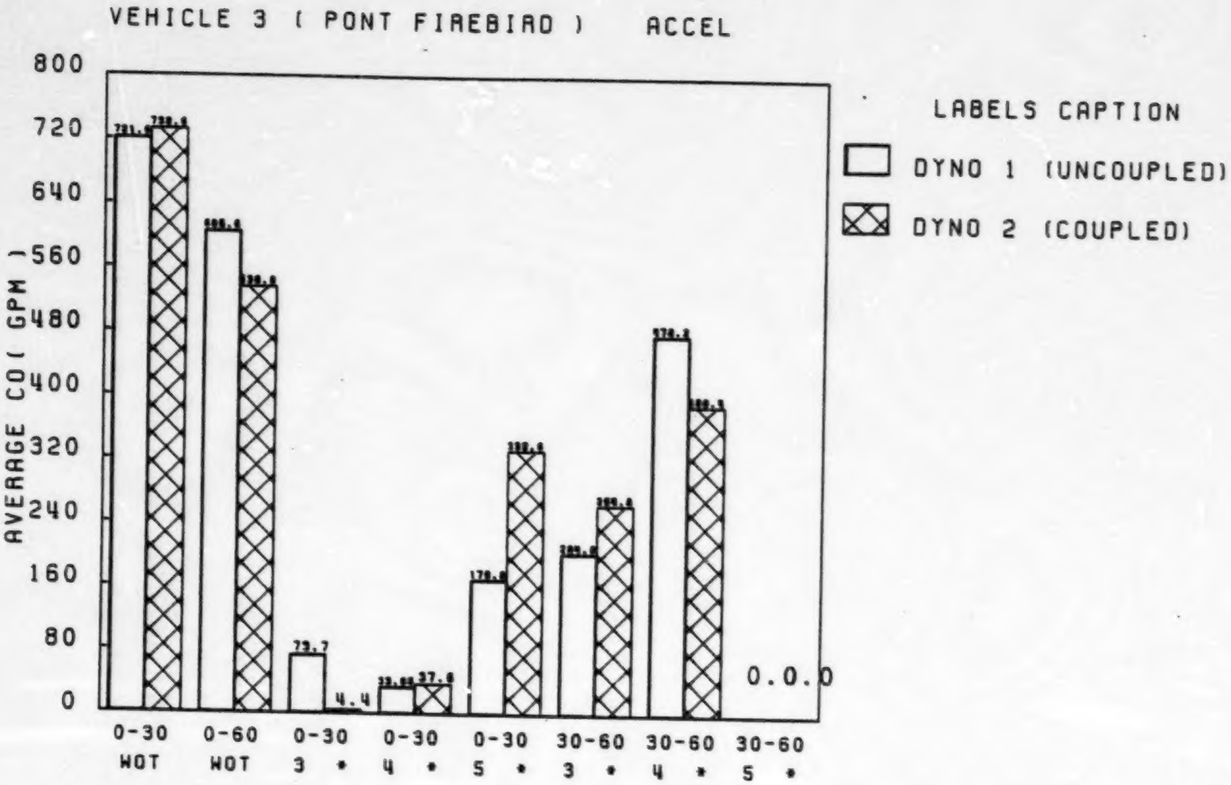
Appendix H-2

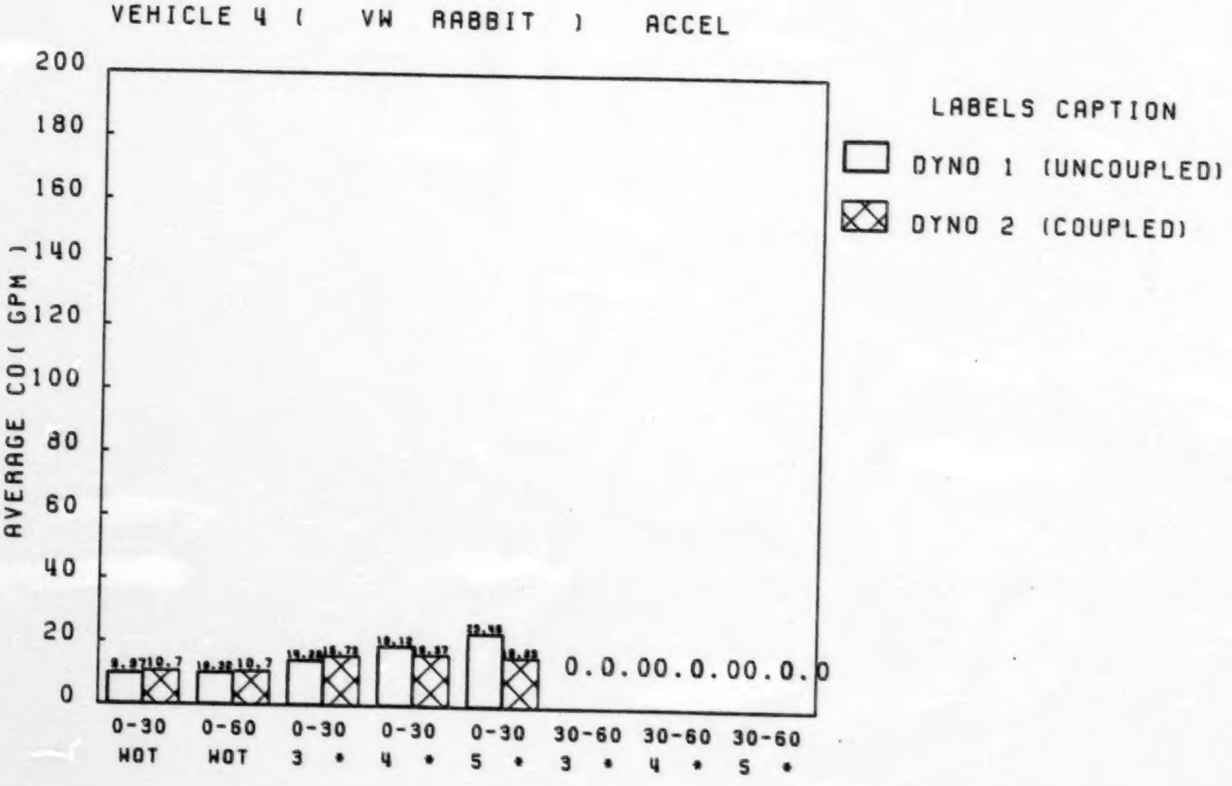
Comparisons of the Mean CO Emissions (grams per mile) During the Various Acceleration Cycles

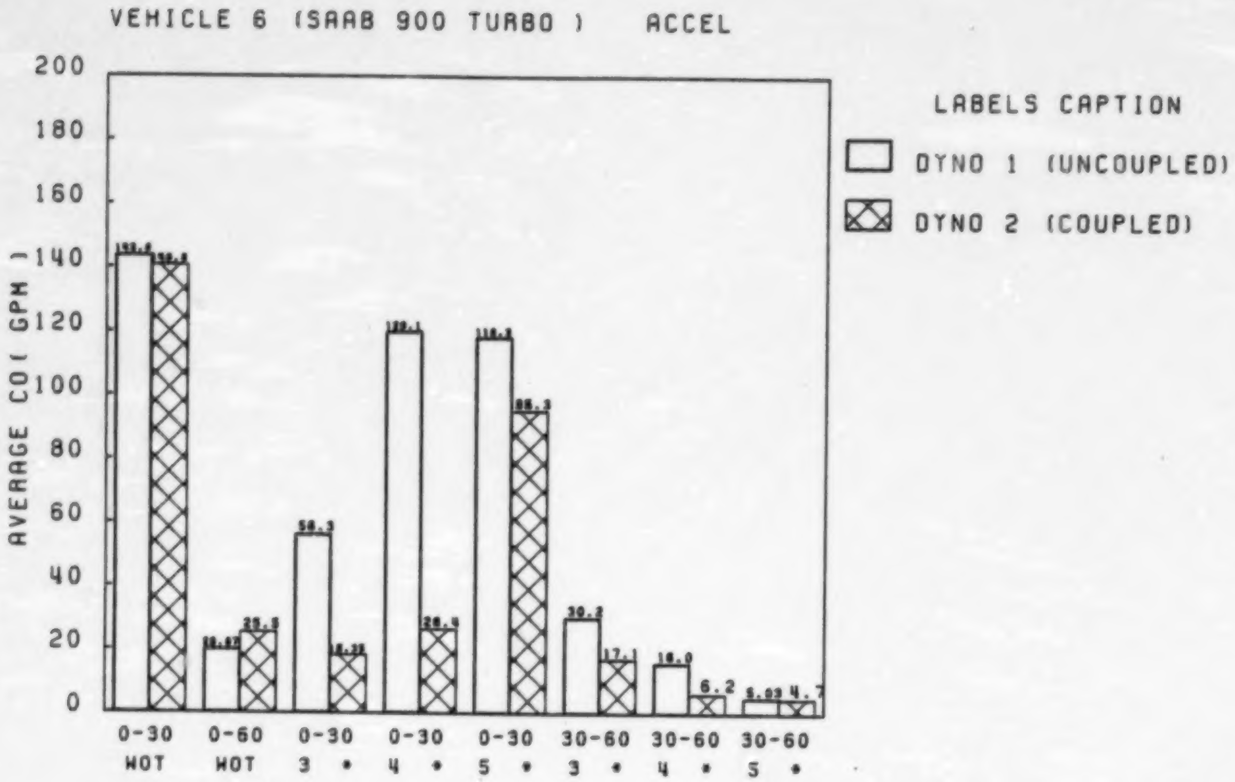
(These histograms are based on data in Tables D19 through D30 in Appendix D).


VEHICLE 1 (FORD PINTO) ACCEL
AVERAGE CO (GPM)
200
180
160
140
120
100
80
60
40
20
0
48.2
22.2
31.7
37.1
0.0
0-30 WOT
0-60 WOT
0-30 3 *
0-30 4 *
0-30 5 *
30-60 3 *
30-60 4 *
30-60 5 *
LABELS CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)

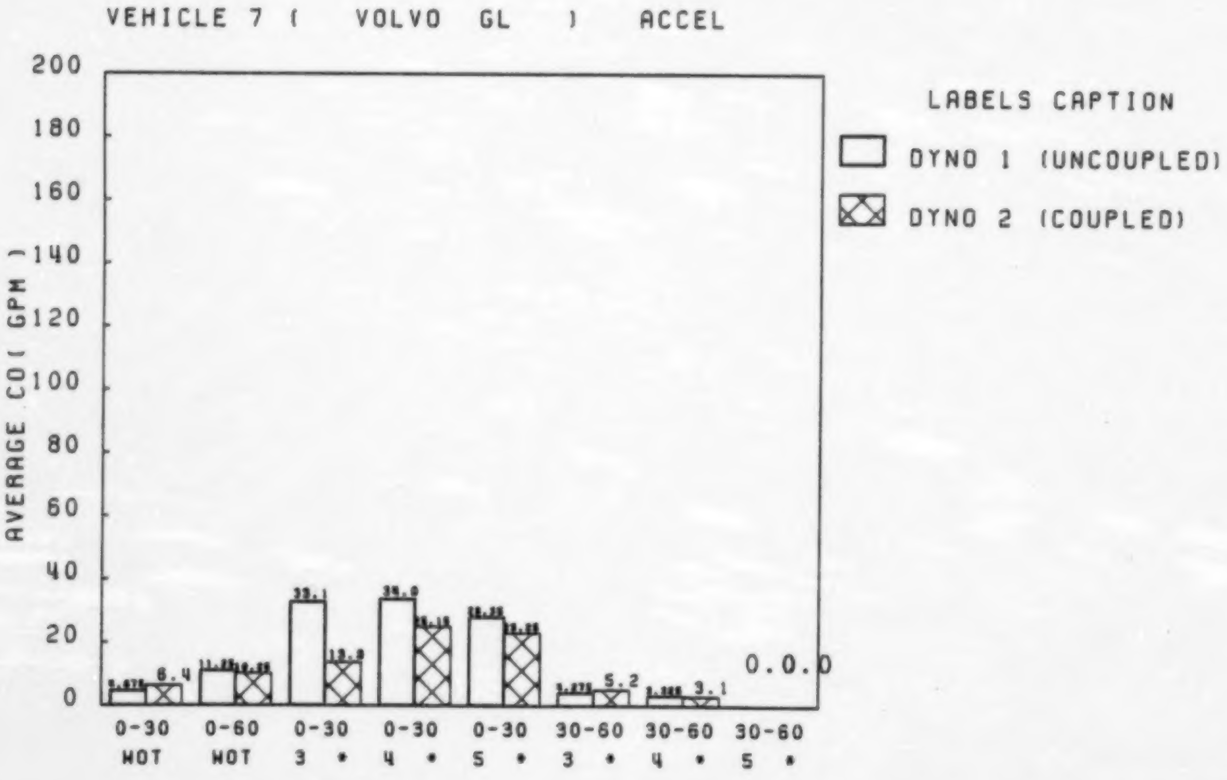

VEHICLE 2 (CHEV IMPALA) ACCEL
AVERAGE CO (GPM)
400
360
320
280
240
200
160
120
80
40
0
0.0
0.0
91.5
79.1
97.0
58.2
79.9
0.0
0-30 WOT
0-60 WOT
0-30 3 *
0-30 4 *
0-30 5 *
30-60 3 *
30-60 4 *
30-60 5 *
LABELS CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)


VEHICLE 3 (PONT FIREBIRD) ACCEL
AVERAGE CO (GPM)
800
720
640
560
480
400
320
240
160
80
0
73.7
4.4
37.0
0.0.0
0-30 WOT
0-60 WOT
0-30 3 *
0-30 4 *
0-30 5 *
30-60 3 *
30-60 4 *
30-60 5 *
LABELS CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)


VEHICLE 4 (VW RABBIT) ACCEL
AVERAGE CO (GPM)
200
180
160
140
120
100
80
60
40
20
0
10.7
10.7
0.0.00.0.00.0.0
0-30 WOT
0-60 WOT
0-30 3 *
0-30 4 *
0-30 5 *
30-60 3 *
30-60 4 *
30-60 5 *
LABELS CAPTION
DYNO 1 (UNCOUPLED)
DYNO 2 (COUPLED)



VEHICLE 6 (SAAB 900 TURBO) ACCEL



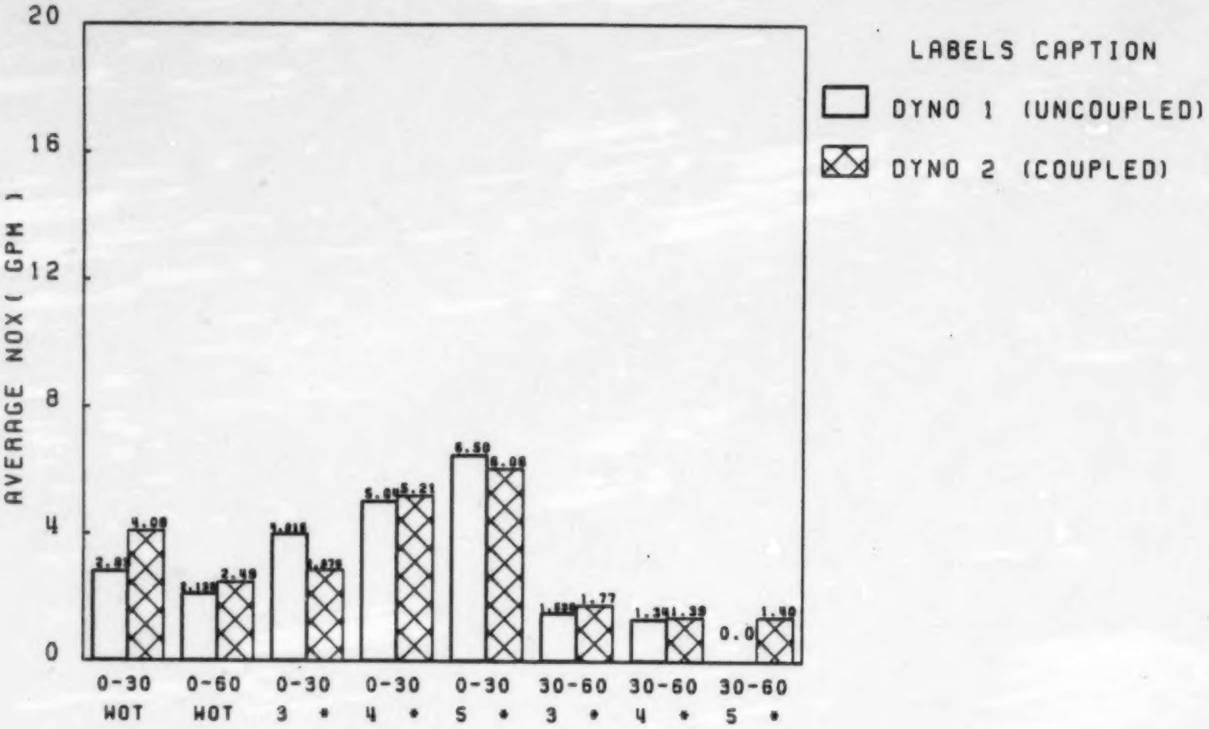
VEHICLE 7 (VOLVO GL) ACCEL

Appendix H-3

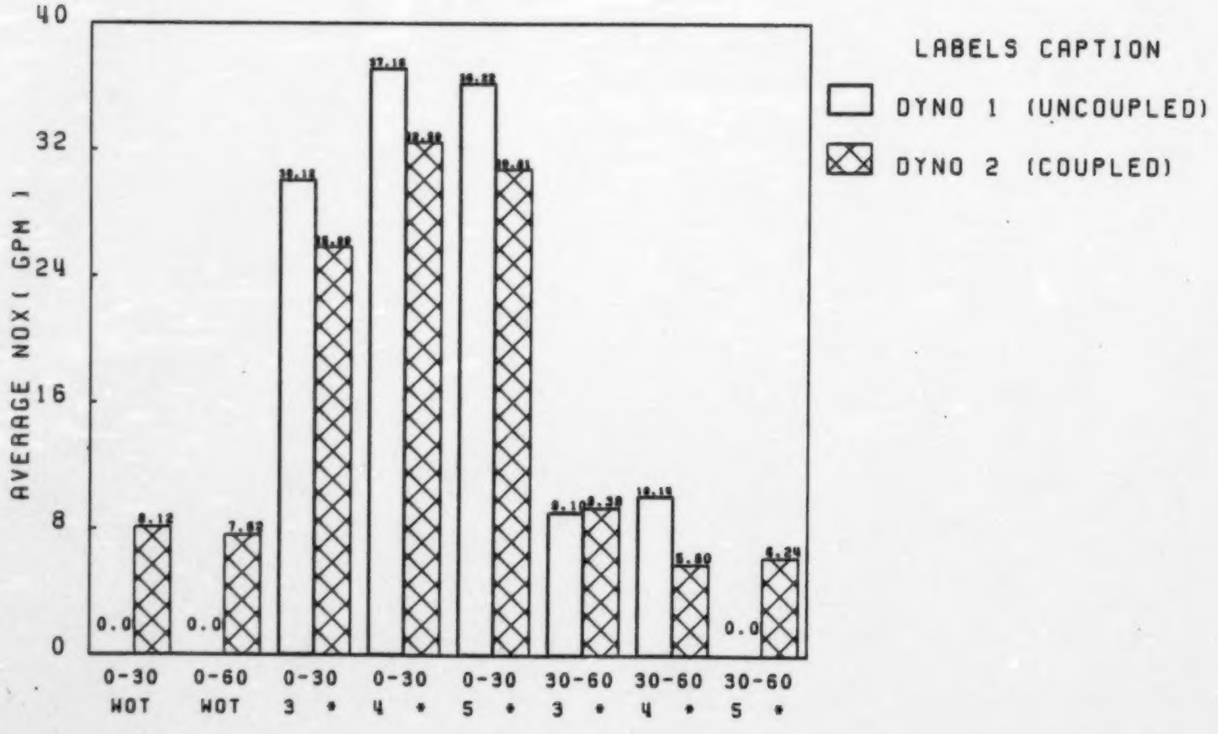
Comparisons of the Mean NOx Emissions (grams per mile) During the Various Acceleration Cycles.

(These histograms are based on data in Tables D19 through D30 in Appendix D).

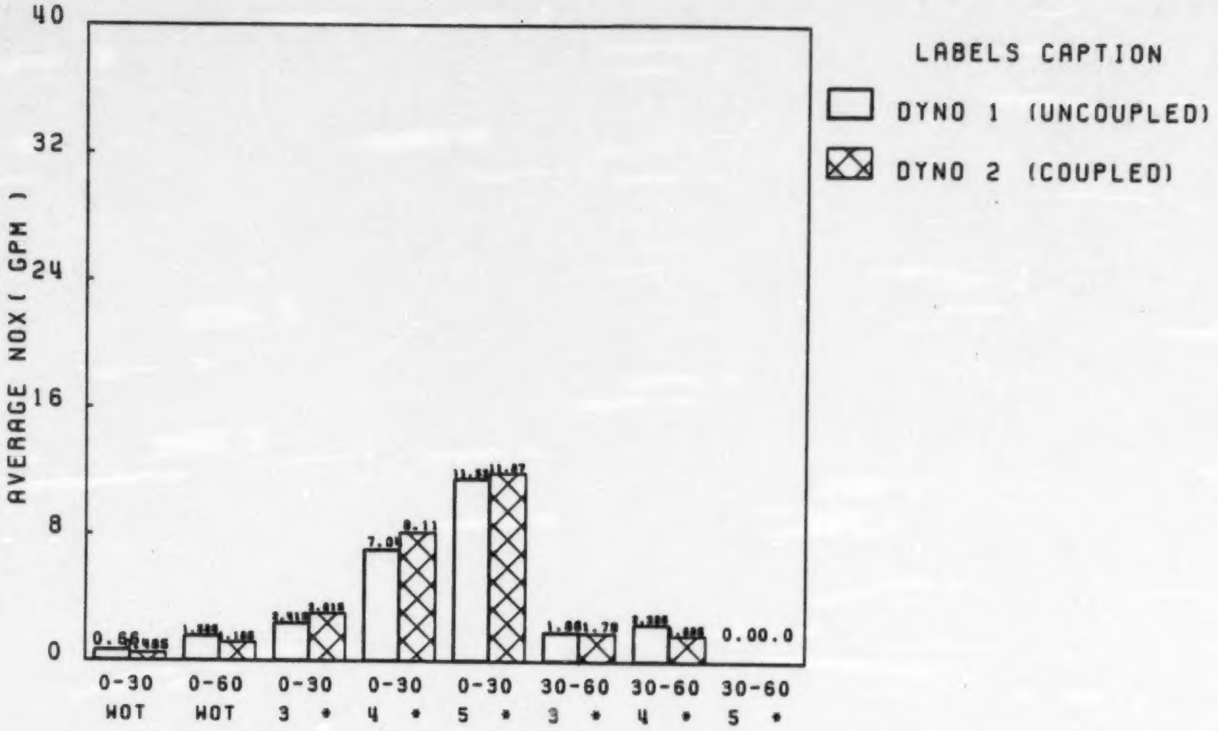
VEHICLE 1 (FORD PINTO) ACCEL



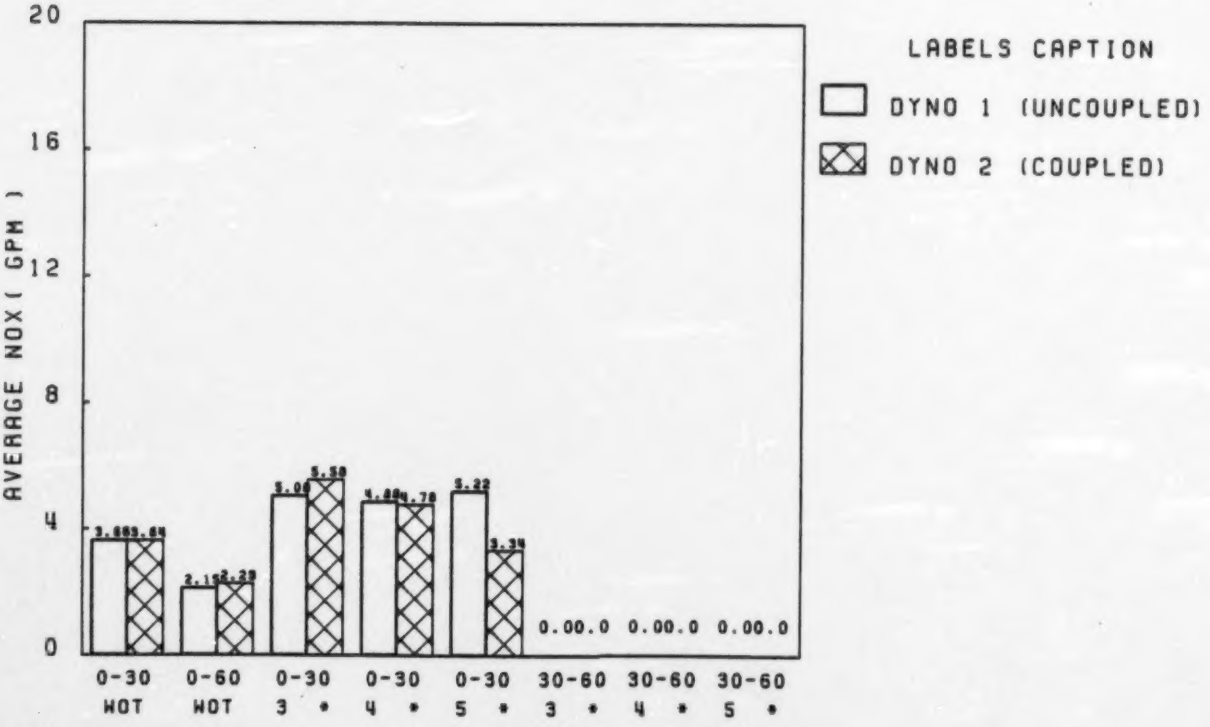
VEHICLE 2 (CHEV IMPALA) ACCEL



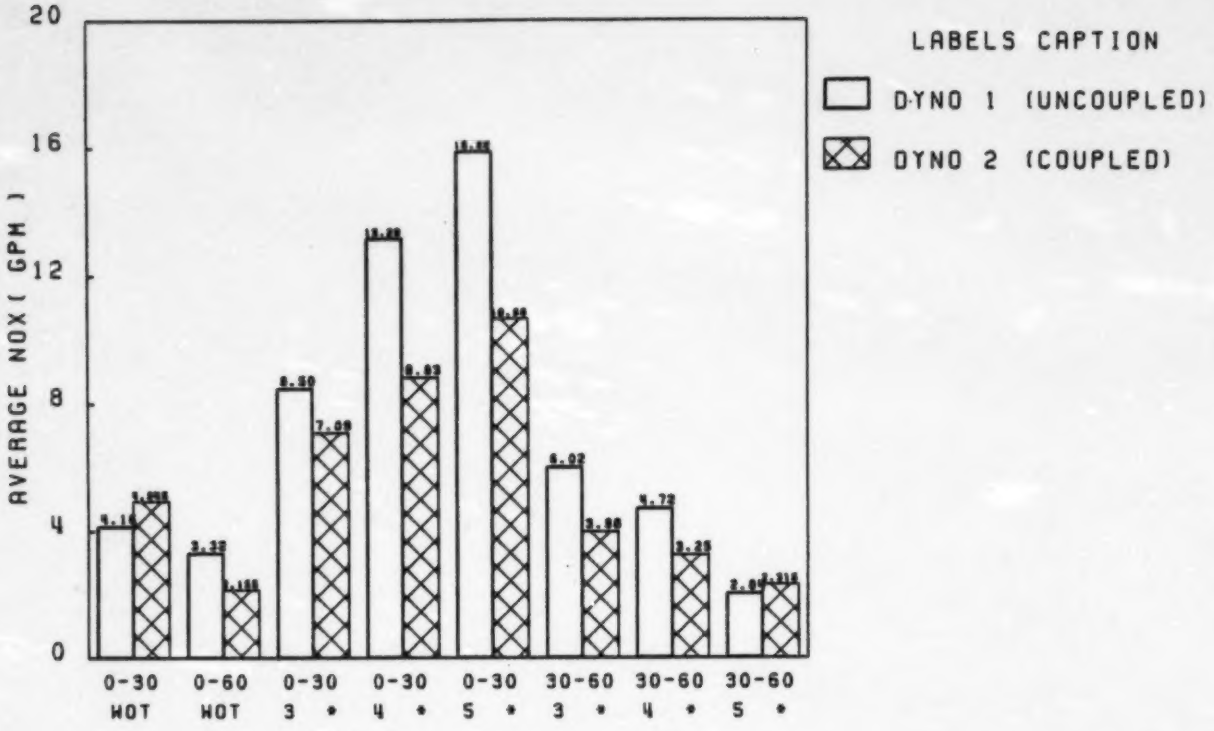
VEHICLE 3 (PONT FIREBIRD) ACCEL



VEHICLE 4 (VW RABBIT) ACCEL



VEHICLE 6 (SAAB 900 TURBO) ACCEL



VEHICLE 7 (VOLVO GL) ACCEL